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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Technical Services Division of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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73-1268. Jaras, A. (Vyskumny ustav Agrochemickej Technologie, Bratislava, Czechoslovakia). **Niektore problemy morenia obilia. [Some problems of seed-dressing.]** *Agrochemia (Prague) 12(12): 376-377; 1972.* (Slovak)

Mercury pesticides used in Czechoslovakia total 12 tons per year and include three seed dressings: phenylmercuric bromide; a combination of phenylmercuric chloride and BHC; and a methylmercuric acetate complex, Agrostan. The most effective of these, Agrostan, also has the lowest toxicity with an oral LD50 of 5000 mg/kg. The alkylmercury compounds are more hazardous than the phenylmercury ones since they are eliminated more slowly, but the latter are less effective and form a toxic dust which may be inhaled during handling. Addition of a stabilizer to the compounds helps prevent the formation and dangers of volatile dialkylmercury. All the compounds accumulate in the soil; however, many of the toxic mercury metabolites are degraded to the relatively harmless mercuric sulfide in the ground. Mercury seed dressings are used despite their hazards, mainly for economic reasons.

73-1269. Bosshardt, H. P. (Eidgenoessische Forschungsanstalt, Waedenswil, Switzerland). **Efficiency of pesticides and industrial chemicals on wildlife.** *Allg. Forstz. 27(47): 932-933; 1972.*

Because of the unexpectedly high persistence and toxicity of the organochlorine pesticides, their use has been restricted in many parts of the world. The use of organochlorines was restricted voluntarily in Swiss agriculture, and an almost complete ban on DDT was instituted in Switzerland on October 1, 1972. Although hunting interests in Switzerland have demanded a ban on organic mercury fungicides, the environmental contamination produced by seed dressing is insignificant compared with that from other sources. Extensive environmental contamination has occurred due to use of herbicides in Viet Nam, treatment of lakes to remove unwanted fish, and industrial pollution. Methods of residue removal are needed.

73-1270. Zitzewitz, H. von (Author address not given). **Zum Einsatz von Lindan statt DDT. [Use of lindane instead of DDT.]** *Allg. Forstz. 28(8): 167; 1973.* (German)

The use of DDT in forestry will be prohibited as of 1974 in West Germany. A suitable replacement by other effective pesticides is necessary. Lindane seems to be one of the best alternative pesticides for use in forestry; it can be used in a 1% concentration for dipping and a 0.1% concentration for spraying. Although lindane has been approved for use in forestry for more than twenty years in Germany, further tests are needed on its persistence under forest conditions.

73-1271. Jukes, T. H. (Div. Med. Physics, Univ. California, Berkeley, CA 94720). **DDT stands trial again.** *BioScience 22(11): 670-672; 1972.* (15 references)

The 1971-1972 hearings on DDT provided adequate examination of the facts surrounding its use and evidence to counter most of the charges of ill effects. The position that DDT is potentially carcinogenic is based on animal experiments; there was no evidence that it is carcinogenic in man. The Hearing Examiner found no indication that DDT in the uses permitted under the registrations in question would damage birds. The daily intake of the pesticide in food has been declining since 1966 and is at present within acceptable limits. The bases for many of the conclusions on the accumulation of DDT in the environment were questioned. The EPA's decision to ban DDT ignored the conclusions of the Hearing Examiner that limited uses of DDT are justified.

73-1272. Wurster, C. F. (State Univ. of New York, Stony Brook, NY). **DDT proved neither essential nor safe.** *BioScience 23(2): 105-106; 1973.* (18 references)

The decision to ban most of the uses of DDT was based on sound scientific information, probably the most comprehensive available for a given pollutant. At the public hearing which was part of the cancellation appeal procedure, the industry failed to establish an essential need for DDT and could not dispute the effects observed on non-target organisms and the possible effects on man. Competent entomologists showed how integrated control was used as an economical, effective, and safe alternative to DDT. Both proponents and challengers admitted DDT created pests by destroying natural enemies. The decline of birds, fish, and other wildlife was attributed to DDT during testimonies. Carcinogenesis and mutagenesis studies in mice and rats were presented to illustrate hazards. One of the crucial issues in the hearing and in the ultimate decision was carcinogenesis.

73-1273. Krampitz, G.; Hardebeck, H. (Inst. Anat. Physiol. Haustiere, Univ. Bonn, Bonn, Germany). **Ueber den Einfluss von polychlorierten Kohlenwasserstoffen auf den Stoffwechsel von Warmbluetern. 1. Mitteilung: Ueber persistente Insektizide in oekologischen Systemen. [The influence of polychlorinated hydrocarbons on the metabolism of warm-blooded animals. 1. Communication: Persistent insecticides in ecological systems.]** *Deut. Tieraerztl. Wochenschr. 80(1): 14-16; 1973.* (German)

Effects of persistent polychlorinated insecticides on metabolic processes in warm-blooded animals and the ecological significance of such pesticides are reviewed. Part of the persistent pesticides metabolizes and is accumulated in animal tissues. Such pesticides are also able to interfere with normal cellular metabolism. Persistent polychlorinated pesticides originally present in the soil migrate into plants, microorganisms, animals, water, and

air only in small quantities which is partly due to their low solubility in water. However, they gradually accumulate across consecutive links of trophic chains, starting from phytoplankton, and ending in man and carnivora. DDT in the ppb range inhibited photosynthesis in four different marine alga species. Reduced photosynthesis by phytoplankton results in decreased oxygen production.

73-1274. Butz, E. L. (Author address not given). **Agriculture and ecology.** *Econ. Planning 8(5): 3-4; 1972.*

The orientation of farm production to markets, stimulated by the U.S. Agricultural Act of 1970, and inducements for seeking the maximum advantage from crop specialization will increase the role of chemicals in agriculture. It would be impossible to feed the total American population without the use of chemicals. Pesticides have and will continue to play a vital role in America, despite environmental questions being raised. A common-sense approach is one which establishes a risk-benefit ratio that satisfies us and one which we can afford.

73-1275. Joint FAO-WHO Expert Committee on Food Additives (World Health Organization, Geneva, Switzerland). **Taegliche Aufnahme von Zusatzstoffen und Umweltchemikalien durch Lebensmittel. [Daily food additive and pesticide intake from food.]** *Ernaehr. Umsch. 20(1): 6-9; 1973.* (German)

The daily food additive and pesticide intake through food was studied by a committee set up by the World Health Organization. A data processing program was designed to provide information on the basis of food intake and toxicological data for a possible revision of maximum daily intake values. For this long-term surveys of intake and frequency and consumption of specific food are more accurate than one-day surveys; food losses occurring during preparation and due to spoilage were considered. Physiological parameters were accounted for and were directed especially towards populations with above-average intake of contaminated foodstuffs. National or regional instead of worldwide consumption figures should be determined.

73-1276. Hanlon, J. J. (Author address not given). **Environmental hazards.** *Fed. Proc. Fed. Amer. Soc. Exp. Biol. Part II 31(6): 101-120; 1972.* (65 references)

Man-made environmental hazards present a more complex problem than those of "natural origins." The help of engineers, physical scientists, behavioral scientists, economists, educators, and political scientists is needed to control these hazards. Progress in eliminating environmental hazards reflects the success of physicians, scientists, and the general public in convincing political leaders to act. Major breakthroughs recently have been the awareness of insufficient information on the effects of widespread chemicals such as persistent pesticides in the biosphere and suspicion of latent and chronic effects of small amounts of chemicals over prolonged periods. Reduction of the chances for pesticide-induced, long-term degenerative disease and teratogenesis and mutagenesis could be achieved as long as the following advances take place: continued development of biological pest control and specific pesticides; development of relatively safe, nonpersistent pesticides and integrated control systems; accumulation of data on more subtle and slowly produced effects through epidemiological studies of large human samples and development of more effective, time-compressing pharmacologic assays. Some approaches to the problem of the decreasing innovative research resulting from the high cost of defensive research in the field of pesticides include: spending Federal money to develop and safety test new compounds or to develop protocols for testing; legislating to permit industrial collaboration.

73-1277. Dempster, J. P. (Nat. Conservancy, Monks Wood Exp. Sta., Abbots Ripton, Huntingdonshire, England). **The influence of pesticides on the crop fauna occurring above ground.** *IIRB Inst. Int. Rech. Betteravieres 6(1): 1-5; 1972.* (8 references)

Pesticide toxicity to natural pest enemies, whether acute or chronic, has resulted in numerous incidences of resurgence, creation of new pests, and even resistance. A direct or indirect effect on food plants has also altered the composition of the fauna. Secondary poisonings have been reported as predators and scavengers eat poisoned animals. Destruction of habitats by herbicides can also affect the inhabitants of a field. The full implications of pesticide usage are difficult to assess without more information on the biology of crop fauna.

73-1278. Pesticide Residue Section of the Ministry of Agriculture and Forestry (Agr. Chem. Inspection Sta., Min. of Agr. Forestry, Japan). **Toxicity and residue tests necessary for registration of agricultural chemicals in Japan.** *Jap. Pestic. Inform. 14: 5-9; 1973.*

The requirements and guidelines for preparing documentation necessary for registration of agricultural chemicals under the 1971 amendment to the Japanese Agricultural Chemicals Regulation Law are discussed. Results of acute toxicity studies using three routes of administration and chronic studies for the greater part of a life-span in more than two species, and results of tests throughout more than two generations in more than one species are required. Residue studies on edible crops and in soil must also be included. Specific tests to be used are described, and documentation can be abbreviated in special cases for both types of information. A description of the chemical, its uses, metabolic fate, etc., are to be a part of the document.

73-1279. Engst, R. (Zentralinst. fuer Ernaehrung, Potsdam-Rehbruecke, DDR). **Probleme der Chlorcholinchloridanwendung (CCC) in der Landwirtschaft. [Problems of chlorocholine chloride (CCC) use in agriculture.]** *Nahrung 16(1): 46-57; 1972.* (German)

The seminar on chlormequat chloride (chlorocholine chloride, CCC) use held April 26-29, 1971, in Jaszowice and Psczyna, Poland, was sponsored by the Psczyna division of the Institute for the Organic Chemical Industry in Warsaw. Agricultural experts from Poland, the DDR, and Hungary were invited to present reports. The lectures presented will be published in full in the original language in which they were delivered in the Reports of the Institute for the Organic Chemical Industry.

73-1280. Engst, R. (Zentralinst, fuer Ernaehrung, Potsdam-Rehbruecke, DDR). **Grundsaetzliche Bemerkungen zur CCC-Problematik. [Basic remarks on problems with CCC.]** *Nahrung 16(1): 48; 1972.* (German)

Increasing world population and expectations for living standards necessitate the use of agricultural chemicals. Chlormequat chloride (CCC) is one of the most widely used plant growth regulators at present although its complete safety has not been proven. The determination of residues in foods and animals feeds, as well as the resulting residues in milk and meat is severely handicapped by the presence of choline and choline-like substances in natural products. The residue levels causing minimal and permanent damage have not yet been determined in long-term experiments. Oral administration should be emphasized in the studies. In establishing the safety factor, it is necessary to remember that grain, with the highest probably chlormequat chloride content, is processed into many basic foods. (Lecture presented at CCC seminar, see abstract 73-1279).

73-1281. Beitz, H. (Kleinmachnow, DDR). **Stand, Perspektiven, und Konsequenzen des Einsatzes von Wachstumsregulatoren in der DDR. [Status, outlook, and consequences of the use of growth regulators in East Germany.]** *Nahrung 16(1): 48-49; 1972.* (German)

In recent years grain production has been increased by the use of high-yield strains and heavy nitrogen fertilization which in turn requires the use of growth regulators such as chlormequat chloride (CCC). CCC coupled with herbicides was used on 58% of the grain acreage in East Germany in 1969. Residue levels of CCC in grain are influenced by the quantity applied, application date, and level of nitrogen fertilization. The increasingly large areas to be treated with CCC will require the use of mechanical or aerial spraying rather than hand spraying, which will increase the danger of drift onto adjacent crops. (Lecture presented at CCC seminar, see Abstract 73-1279).

73-1282. Anonymous. **Vortragstagung "Ernaehrung und Gesundheit" vom 14. bis 17. Juni 1971 in Potsdam (DDR). [Lecture meeting on "Nutrition and Health," held in Potsdam (DDR), June 14-17, 1971.]** *Nahrung 16(2): 123-134; 1972.* (German)

The 25th Anniversary meeting of the Central Institute for Nutrition was held jointly with the lecture meeting on "Foreign substances as food-chemical and toxicological problems in nutrition," sponsored by the Food Chemistry section of the East German Chemical Society. The symposium recognized that problems of food contamination are demanding increased attention as a result of increasing use of chemical and engineering aids in food production along with increasing environmental pollution. The symposium was opened by Prof. Freimuth, chairman of the food chemistry section, who outlined the overall problems and emphasized the necessity of interdisciplinary cooperation. Individual lectures dealt with specific and general pesticide-related topics as well as food contamination with synthetic flavoring agents, natural toxins, and packing components.

73-1283. Medved, L. I. (All-Union Res. Inst. Hyg. Toxikol. Pestic., Polymers, and Plastics, Kiev, USSR). **Pestizide und Hygieneprobleme. [Pesticides and sanitation problems.]** *Nahrung 16(2): 124-125; 1972.* (German)

The increasing use of biologically active substances is a woldwide problem, particularly in view of their circulation in the biosphere. Prior to official acceptance of a pesticide for use in the USSR, the following requirements must be fulfilled: high efficacy against pests; relatively low cost compared to the damage prevented; low mammalian toxicity compared to previously used preparations. Preparations which persist for more than two years, undergo great biological magnification, or produce delayed damage or allergic reactions are not acceptable. Studies are in progress at the Kiev Institute for development of safer, more effective pesticides. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1284. Verschuuren, H. G. (Rijks Inst. voor de Volksgezondheid, Utrecht, The Netherlands). **Moderne Gesichtspunkte bei der toxikologischen Beurteilung von Pestiziden. [Modern viewpoints in the toxicologic evaluation of pesticides.]** *Nahrung 16(2): 126-127; 1972.* (German)

International discussions on toxicologic problems, particularly with respect to pesticides, were seldom held before 1960. The United Nations and various European organizations have sponsored symposia, published guidelines, and issued procedural manuals on pesticide toxicology within the past decade. Since toxicologic data is generally collected by industry representatives and evaluated by government officials, it is necessary to create an advisory group to rule on differences of opinion. Con-

troversial points in pesticide toxicology include determination of the significance of observed effects and establishment of a no-effect level; establishment of the margin of safety; consideration of persistence; evaluation of metabolite significance; and relating to the overall picture of environmental pollution. (Lecture at symposium on nutrition and health, see abstract 73-1282)

73-1285. Chaboussou, F. (Sta. de Zool., Inst. Nat. de Rech. Agron., Bordeaux, France). **Procedes culturaux et resistance de la plante. [Cultural processes and resistance of plants.]** *Phytoma 25(245): 13-17; 1973.* (7 references) (French)

Studies on the effects of soil composition, fertilizing, grafting, and certain pesticides on pest-resistance of plants and assumptions on the mechanisms of resistance are reviewed. Soil structure, primarily through its water balance, may either further or inhibit infestation. Potassium deficiency favors infestation; the effect of nitrogen fertilizers depends on their form. Pesticide treatment of plants may lead to increased copper, iron, zinc, magnesium, sulfur, or phosphorus levels. Certain organophosphorus acaricides and insecticides cause proliferation of *Eotetranychus orientalis* in citrus plants; DDT affected *Aphis fabae* on beet. Plant resistance and metabolic activity such as accumulation of starch, protein, phenolic compounds, and rate of respiration were directly correlated. All conditions favorable for the decomposition of soluble substances in tissues increase the resistance of plants against parasites.

73-1286. Siriez, H. (Author address not given). **Le DDT et la sante humaine. [DDT and human health.]** *Phytoma 25(245): 25-29; 1973.* (French)

Studies on DDT are reported. Although large doses of DDT caused hepatic tumors in mice, chronic tests conducted in the U.S. on humans receiving DDT doses up to 100 times the officially accepted maximum daily intake for 1.5 years revealed no morbid changes or poisoning symptoms. Equilibrium between intake and elimination, in the form of DDA with the urine, occurred after one year; fat DDT content stabilized as a result. No carcinogenic effects of DDT in humans have ever been evidenced. While there seems to be no reason for abandoning use of DDT, its use in temperate climates, unlike tropical and subtropical, is not indispensable. Effective January 1, 1973, DDT use in the U.S. is prohibited. Its chief substitute will be methyl parathion, a pesticide of low stability but high acute toxicity.

73-1287. Siriez, H. (Author address not given). **Le DDT toujours en question. [DDT still under questioning.]** *Phytoma 25(245): 34-35; 1973.* (French)

Recent developments in the debate around DDT are summarized. Large doses of DDT produced hepatic tumors in mice. However, the tumor incidence in workers in DDT manufacturing plants did not differ from that of the general population even though the blood DDT level was 50 to 100 times larger. There is no proof of DDT being carcinogenic in humans. An almost total ban on DDT use has been recently introduced in the U.S.

73-1288. Robert, E. (Author address not given). **2e Conference de la F.A.O. sur les relations entre l'ecologie et la defense des cultures. [Second FAO conference on relationships between ecology and plant protection.]** *Phytoma 25(245): 37-38; 1973.* (French)

The ecological effect of pesticides used in plant protection was the central issue discussed in the FAO world conference held Dec. 11-16, 1972, in Rome. Pesticides will be required in increasing amounts worldwide and attention is being given to new, multidisciplinary approaches to the problems of the use and application. Reasonable use of pesticides under proper conditions and the development of new biological control methods and preparations are urged. Plant protection should become an integrated complex involving ecology, economics, and biology.

73-1289. Berner, C. (Lab. Cantonal de Chimie, Geneva, Switzerland). **Un probleme d'actualite: les residus de pesticides. [A problem of major concern: pesticide residues.]** *Praxis 60: 227-229; 1971.* (French)

General problems of pesticide residues and results of actual measurements in food are presented. DDT, BHC and its isomers, chlordane, aldrin, dieldrin, and heptachlor are dangerous because of high stability and persistence, high liposolubility, and slow rates of elimination from the organism. Organochlorine pesticides interfere with hepatic cells and the central nervous system. A chlordane concentration of 2.5 mg/kg causes hepatic and renal lesions. Organophosphorus pesticides, while less stable than organochlorine compounds, inhibit cholinesterase activity and may metabolize into more toxic compounds. Dithiocarbamates liberate carbon disulfide capable of reacting with amide groups of proteins and amino acids. Arsenicals are known to be carcinogenic and nephrotoxic. Organic mercury compounds attack the central nervous system. Residue determinations in food products in Switzerland revealed consistent presence of pesticide residues in various foods. Especially high concentrations in milk products and vegetables, often in excess of the maximum allowable concentrations established by the World Health Organization, were determined. None of the human milk samples tested complied with the standard.

73-1290. Amendola, G.; Botre, C. (Pretura di Roma, Lab. d'Igiene e Profilassi, Rome, Italy). **Cause, meccanismi e conseguenze dell' inquinamento idrico. [Causes, mechanisms, and consequences of water pollu-**

tion.] *Rass. Chim. 24(4): 166-178; 1972.* (42 references) (Italian)

Factors involved in water pollution and its consequences and control are reviewed. Pesticides polluting water are acutely hazardous. According to data, 12 mg of parathion is lethal to man, indicating this pesticide is five times more toxic than potassium cyanide. Organophosphates are considered less dangerous than organochlorines because of their degradability. Organochlorines such as DDT decrease the photosynthesis rate of most algae varieties and impair the marine ecological equilibrium. Organochlorine accumulation in fatty tissues creates a hazard throughout certain food chains. In man organochlorines can cause severe damage of the bone marrow and liver leading to cirrhosis, hepatic necrosis, and even leukemia or other neoplastic diseases. A scientific approach with international cooperation is needed to control water pollution. Pesticide manufacturing industries should treat their effluents; cooperation at local levels would contribute to the preservation of the environment.

73-1291. Telford, H. S. (Dept. Entomol., Washington State Univ., Pullman, WA 99163). **Introduction.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 1-4.* (1 reference)

The amount of freedom to use pesticides granted applicators and dealers by legislators will depend on the discretion shown by them. Carelessness has generally been the cause of wide distribution of pesticides and other pollutants in soil, air, and water, and the applicator is in a position to reduce indiscriminate use. Despite the tremendous amounts of pesticides used in this country, the National Academy of Sciences' Committee on Persistent Pesticides reported no evidence that present levels in man's food and environment are detrimental to his health. No authentic cases have been reported in which human health was endangered when directions for pesticide use were followed explicitly. No reliable data exists indicating that registered pesticides cause cancer or other diseases in humans. It is, however, necessary to continue careful application practices and to watch for unwanted pesticide effects. This volume was compiled to provide basic information on pest control for those selling and applying pesticides. Included are principles of pest control, a compendium of chemicals, methods of application, health and environmental hazards, and regulations.

73-1292. Harwood, R. F. (Dept. Entomol., Washington State Univ., Pullman, WA 99163). **Nonchemical pest control.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp 13-16.* (3 references)

Interest in nonchemical pest control has been renewed because of resistance to chemicals developed by many pests, undesirable environmental effects of the chemicals, and the growing accumulation of knowledge regarding the pest and its relationship to its hosts, necessary for nonchemical control. The degree of injury caused by the pest, the speed with which control must be obtained, the threat of damage to the environment through the use of chemicals, and economics affect the choice of nonchemical methods. These methods have been much more prominent in plant disease control than in insect control. Plant resistance, crop rotation, seed and plant certification, growth control, field sanitation, control of the planting date, and modification of the environment have been useful in preventing both plant diseases and insect invasion. Control of insects has also been achieved through release of natural enemies, integrated use of chemical and nonchemical techniques, and the use of insect hormones, sex attractants, and sterilized insects. Management of the overall pest population, as opposed to destruction of one species, is becoming an important feature in crop protection.

73-1293. Deck, E. (Grain and Chem. Div., Washington State Dept. Agr., Olympia, WA). **Washington pesticide laws.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 91-106.*

The Washington Pesticide Application Act of 1961 and the Washington Pesticide Control Act of 1971 give authority to the Department of Agriculture to protect the general public and the environment. The director of the department is responsible, following public hearings, for promulgating regulations governing the use of pesticides found injurious to people, pollinating insects, animals, crops, or lands. Regulations have been developed to protect susceptible crops from the effects of desiccants and defoliants and pollinating insects from insecticides. Aerial application of Di Syston-liquid (disulfoton), endrin, parathion, phosdrin (mevinphos), schradan, systox (demeton), temik (aldicarb), TEPP, thimet (phorate)-liquid, and zinophos (thionazin) are limited and may not be applied if weather conditions would create damaging physical drift or volatilization. Applicators and operators must be licensed and are prohibited from low flying over densely populated areas or even an occupied structure without permission of the parties involved. Accurate records must be completed the day applications are made and kept for three years. All pesticides must be registered with the State Department of Agriculture. The director may cancel registration following a hearing if he determines that the pesticide or its label does not comply with the act. Dealers handling highly toxic pesticides and pest control consultants must be licensed. Pesticides must be sold in original manufacturers' packages and labels must include a proper warning statement. Possession and use of sodium fluoroacetate, fluoracetamide, thallium, phosphorus pastes, and other products are limited. Distribution, storage, transportation, and disposal are covered in the act.

73-1294. Deck, E. (Grain and Chem. Div., Washington State Dept. Agr., Olympia, WA). **Federal agencies responsible for the regulation of pesticides.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 107-110.*

Since the introduction of synthetic organic pesticides, pesticide regulation has increased and responsibility for most regulation has shifted from the USDA to the Environmental Protection Agency. Original Department of Agriculture laws regulated labeling and interstate distribution. The Federal Insecticide, Fungicide and Rodenticide Act of 1947 required proof of acceptability of a product from the manufacturer. Residue tolerances in food were initiated in 1948, and in 1954 the Miller Amendment to the Food and Drug laws formalized tolerance setting procedures of the FDA. HEW and the Department of the Interior began to share more responsiblitity for pesticide regulation in 1961 as increased emphasis was placed on protection of wildlife and the environment. All regulation of pesticides previously in the hands of USDA, HEW, and the Department of the Interior is now the responsibility of the Environmental Protection Agency. Pending legislation would govern intrastate pesticide products and provide for licensing of dealers, formulators, and applicators. The FDA and the USDA still monitor food and feed for pesticide residues. The Department of Transportation regulates transporting of all hazardous chemicals and the Federal Aviation Administration oversees the dispersing of pesticides by aircraft.

73-1295. Turner, S.W. (1001 4th Ave. Seattle, WA 98104). **Pesticide product and usage liabilities.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp, 119-124.*

Superior courts of Washington have held both contractor and employer jointly responsible in cases of liability for drift of pesticides. In some cases, however, the landowner may file a complaint against the applicator. The blame is sometimes shifted to the manufacturer if the label does not warn of accidental drift. When a pesticide is applied to the wrong field by an applicator and damage results, the applicator is normally held on the basis of trespass. Generally, applicators or growers have not been held responsible for damage incurred when it was proven that drift did not occur and bees had trespassed on a treated field. In order to avoid liability applicator and seller should not deviate from recommended terms and conditions of use found on the printed label.

73-1296. Johanson, C. A. (Dept. Entomol., Washington State Univ., Pullman, WA 99163). **How to reduce poisoning of bees from pesticides.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 539-548.*

Practices and materials used on alfalfa, clover, mint, and corn are governed by the Washington Department of Agriculture. Proper timing of pest-control usually reduces damage to bees without increasing control cost or inconveniencing the grower. Other measures can be taken to reduce bee poisoning. Insecticides toxic to bees should not be applied to crops in bloom or used if alternatives are available. Ground application and evening applications are the least hazardous. Unused dusts and sprays should be disposed of properly. Orchard cover crops should be mown or beaten before spray applications. A preventive program of early season application is less dangerous to bees and other beneficial insects. Beekeepers should locate hives away from areas of intense insecticide use and remove hives from areas to be sprayed for a length of time dependent on the compound used. Care should be exercised in use of insecticides for control of pests around the apiaries. A table is included which compares the use ratings and residual toxicities of various insecticides to wild bees.

73-1297. Franz, J. M. (Biol. Bundesanstalt fuer Land- und Forstwirtschaft, Inst. fuer biol. Schaedlingsbekaempfung, Darmstadt, Germany). **Die Stellung der biologischen Schaedlingsbekaempfung im integrierten Pflanzenschutz. [The role of biological pest control in integrated plant protection.]** *Z. Angew. Entomol. 72(1): 1-6; 1972.* (8 references) (German)

General considerations are presented on biological and biotechnical pest control as part of an integrated pest management. Biological control comprises both the addition of new biotic elements to actively reduce pest organisms and the protection of beneficial organisms and natural enemies of pests already present. Biotechnical pest control measures imply the use of sound, light, hormones, pheromones, repellants, stimulants, and attractants. The use of chemical agents constitutes only part of the integrated plant protection. The use of pesticides alone may have serious consequences: the systematic use of broad-spectrum insecticides in cotton plantations in Nicaragua required the number of sprayings to be boosted to 30-40 per season with the appearance of resistant mosquitoes as a result. These hardly controllable vectors ultimately led to a marked increase in the incidence of malaria and equine encephalitis.

73-1298. Freye, H.-A.; Scheufler, H.; Schmidt, R. (Biol. Inst. des Bereichs Med., Martin-Luther Univ. Halle-Wittenberg, Halle, DDR). **Tierexperimentelle Untersuchungen zur embryotoxischen und teratogenen Wirkung chemischer Substanzen–Modellstudien. [Animal experiments on embryotoxic and teratogenic effects of chemicals–model studies.]** *Z. Gesamte Hyg. 19(1): 45-46; 1973.* (German)

Methodological problems involved in embryotoxic and teratogenic effect studies of chemical substances on animals are described and a standard animal test model proposed. Mice, especially AB/Jena–Halle and C 57 B1

strains, are recommended as test animals for embryotoxic and teratogenic investigations. Embryotoxic and teratogenic effects of cyclophosphamide and trypan blue, and embryotoxic effects of DDT were studied in pregnant AB/Jena-Halle line mice. The fetuses were removed on the 18th day of gestation and the number of corpora lutea, live and dead fetuses, implantations, weight, resorption and teratism recorded as test parameters. Teratisms were determined by microscope after skeletal staining and after preparations of frontal sections of the head.

73-1299. Nishimoto, T.; Uyeta, M.; Taue, S. (Kochi Prefect. Hyg. Res. Inst., Kochi, Japan). **[The accumulation of organochlorine pesticides in human adipose tissue.]** *Igaku No Ayumi (Progr. Med.) 73(6): 275-277; 1970.* (14 references) (Japanese)

Seventy-four samples of human adipose tissue were collected from two hospitals in Kochi City between July 1969 and March 1970 and subjected to pesticide residue extraction tests. The samples were from normal patients not particularly exposed to organochlorines. Ages ranged between 24 and 85, and 74% fell in between 41 and 70 years. Organochlorines were extracted by the AOAC method and identified and measured by gas chromatography. α-, β-, and γ-BHC (lindane), p,p'-DDT, p,p'-DDE, TDE dieldrin, and heptachlor epoxide were detected; delta-BHC, and o,p'-DDT were present in traces; aldrin, endrin, and heptachlor were not present at all. Total BHC was 12.17 ppm, total DDT 6.92 ppm, and dieldrin 0.46 ppm. Ninety-seven percent of total BHC was β-BHC. Generally, much higher accumulations were noted in men. There were no age or occupational differences, other than the slightly higher average among the agricultural population and two farmers who had obviously used BHC and whose fat contained residues of more than 50 ppm (β-BHC). The total β-BHC accumulation in this report was approximately 30 to 40 times the figures that had appeared in foreign publications.

73-1300. Fusi, P.; Franci, M. (Inst. Di Chim. Agr. e Forestale Dell'Univ. Di Firenze, Florence, Italy). **Controllo chimico e biologico di residui di atrazina nel terreno. [Chemical and biological studies of atrazine residues in the ground.]** *Agrochimica 16(4-5): 377-386; 1972.* (11 references) (Italian)

Atrazine was spectrophotometrically and biologically determined in silty, clayey, and sandy soils after applications of different doses. Spectrophotometry of methanol and aqueous extracts after reaction with pyridine showed atrazine's increasing persistence from sandy toward the silty soils, confirming the importance of the chemical and mechanical nature of the ground. Biological tests were performed by evaluating the germination yields and growth parameters of *Lollium perenne* (an atrazine-susceptible herb) and Wisconsin 355 maize (an atrazine-resistant plant). Regression analysis of *Lollium perenne* parameters with respect to herbicide residues indicated closer relationships with the water soluble aliquot than with the methanol-extractable atrazine regardless of the type of soil.

73-1301. Deichmann, W. B.; Cubit, D. A.; MacDonald, W. E.; Beasley, A. G. (Res. and Teaching Cent. of Toxicol., Dept. of Pharmacol., Univ. of Miami, Sch. of Med., Miami, FL). **Organochlorine pesticides in the tissues of the great barracuda (*Sphyraena barracuda*) (Waldbaum).** *Arch. Toxikol. 29: 287-309; 1972.* (36 references)

The abdominal fat of adult barracuda caught in Florida waters was analyzed for organochlorine pesticides. Of a total 281 fish, 63% had 5 to 760 g abdominal fat. The fat of 96% of these fish contained DDT or one of its isomers or metabolites. Except for the smallest and largest fish, the ratio of "total" DDT in fat to kg body weight remained constant (0.08 to 0.11 mg/kg). During the spawning season, in addition to fat, certain organs and tissues of these fish were also analyzed. The highest pesticide concentrations were found in the fat. Assigning to the concention of "total" DDT in abdominal fat a value of 10, the rating for the concentration of "total" DDT in the liver becomes approximately 1.1, in the pyloric cecum 1, in flesh 0.7, and for the fully developed gonads 0.5. It seems unlikely that larval barracuda are affected unfavorably by these low concentrations of DDT unless they are exceedingly sensitive to this compound. Since the quantity of abdominal fat and tissue pesticide concentrations were highest at the beginning and lowest during the height and end of the spawning season (and if this should apply to other fish species), then it can be concluded that spot-checking fish tissues for pesticides once or twice a year, more likely than not, provides misleading information with regard to pollution. Tissues and flesh of all barracuda were fed to cats, with no symptoms of ciguatera. (Author abstract by permission)

73-1302. Butler, P. A. (Gulf Breeze Environmental Res. Lab., Gulf Breeze, FL 32561). **DDT in estuarine molluscs.** *BioScience 22(12): 690-691; 1972.*

A Letter-to-the-Editor summarizes results of a study of organochlorine residues in estuarine molluscs in 15 coastal states over 2 to 8 years. The residues were associated primarily with agricultural use. Maximum DDT residues (in 0.5% of the samples) were 1.0 to 5.4 ppm. Dieldrin residues were found in 15% of the samples. Endrin, mirex, toxaphene, and polychlorinated biphenyls were observed in only 3% of the molluscs. DDT reached maximum levels in 1968-1969 and has declined since then on the Atlantic, Gulf of Mexico, and Pacific coasts.

73-1303. Camoni, I.; Gambetti, L.; Gandolfo, N.; Ramelli, G. (Ist. Superiore di Sanita, Lab. di Chimica, Rome, Italy). **Residui di pesticidi clorurati in campioni di terra e di barbabietole dell' Agro Pontino. [Chlorinated pesticide residues in soil and beet samples collected near Agro Pontino.]** *Boll. Lab. Chim. Prov. 22(4): 740-751; 1971.* (11 references) (Italian)

Pesticide residues in soil samples collected near Agro Pontino (province of Lazio) in August and September 1968 averaged 0.054 ppm aldrin, 0.148 ppm dieldrin, 0.017 ppm heptachlor, 0.024 ppm heptachlor epoxide, 0.021 ppm lindane, and 0.044 ppm DDT after extraction with hexane/acetone. Aldrin, dieldrin and heptachlor epoxide levels in beet samples (extracted

with benzene) were approximately one-fifth the levels in soil samples. Heptachlor, lindane, and DDT levels in beets were 1.8, 1.4, and 1.2 greater than those in soil. Although accumulation of these compounds appeared to be considerable, no acute hazards for livestock or man could be detected; the temporary limits established by the European Common Market are 0.2 ppm for chlorinated cyclodienes, 1.0 ppm for DDT and its isomers, and < 2 ppm for lindane in fruits and vegetables. A complete description of the analytical procedures used for the above determinations is included.

73-1304. Benson, W. W.; Smith, P. (Community Study on Pestic., Idaho Dept. Health, Statehouse, Boise, ID 83707). **Pesticide levels in deer.** *Bull. Environ. Contam. Toxicol. 8(1): 1-9; 1972.* (12 references)

In conjunction with a DDT spray program in Idaho's Salmon National Forest levels of the pesticide were determined in samples of adipose tissue collected from mule deer three months and five years and three months after applications. Analytical techniques differed. A mean level of 19.36 ppm total DDT was observed in exposed animals three months after spraying; control animals had levels < 0.1 ppm. Mean *p,p'*-DDT levels were 17.22 ppm in exposed and 0.05 ppm in control animals. After five years the mean total DDT residue was 0.18 ppm in animals from the sprayed area and 0.05 ppm in controls. *p,p'*-DDT was still the persistent residue, a finding unlikely in terms of human biochemistry, but observed in other studies with deer. Exposed males had more DDT derived materials than exposed females. Since only about 3% of Idaho's deer population reach the age of five years, deer sampled in 1969 were probably not alive at the time of DDT application. Their residues would tend to reflect chronic exposure and the pesticide content in local vegetation.

73-1305. Yule, W. N.; Duffy, J. R. (Chem. Control Res. Inst., Canadian Forestry Service, Dept. Environ., Ottawa, Ontario, Canada). **The persistence and fate of fenitrothion insecticide in a forest environment.** *Bull. Environ. Contam. Toxicol. 8(1): 10-18; 1972.* (18 references)

Forest soil and foliage levels of fenitrothion and its metabolites were determined in an area sprayed with five oz/acre twice in 1969 and 4 oz/acre once in 1970. In an area containing spruce and fir relatively large amounts of fenitrothion (2 to 4 ppm) were found in foliage while < 0.04 ppm was found in the soil. About half of the initial deposit remained after four days and only 15 to 30% was present after two weeks. The rate of loss was greater from spruce than from fir. The remaining residue disappeared at a rate slower than anticipated from its fate in various crops. Under the operational conditions employed only traces of breakdown products were found (< 0.02 ppm of fenitro-oxon and *p*-nitrocresol); oxidation of fenitrothion results in increased toxicity. Ethyl acetate proved to be the best extraction solvent for determining fenitrothion in the study. Hexane/acetonitrile partition and a charcoal column were used for cleanup, and the metabolites were separated from the parent compound on a silica gel column. A gas chromatograph equipped with flame photometric detector was used for the determinations.

73-1306. Yule, W. N.; Hildebrand, M. J.; Smith, G. G.; Fox, R. S. (Chem. Control Res. Inst., Canadian Forestry Service, Dept. Environ., Ottawa, Ontario, Canada). **DDT in forest trees and lumber.** *Bull. Environ. Contam. Toxicol. 8(1): 19-25; 1972.* (11 references)

DDT determinations were made in different parts of four tree species grown in an area treated with DDT for at least 11 years. No significant uptake or translocation from roots or foliage into areas of the tree where DDT had not been externally applied occurred. Measurable amounts of DDT were found in the root hair-mycorrhiza parts of spruce and pine, but these residues were less than those in surrounding soil. Only traces were found in the trunks and larger roots. Maple sap, up to a concentration level of 50 times, contained no DDT, and analysis of thicker syrups was not possible. The main constituent of the residues was *p,p'*-DDT (80%), and DDE and *o,p'*-DDT occurred in approximately equal amounts. The highest level of DDT found in any lumber sample was 0.06 ppm. It may be assumed from this study that raw pulp and paper produced from these forests are not contaminated with significant amounts of DDT.

73-1307. Carman, G. E.; Westlake, W. E.; Gunther, F. A. (Citrus Res. Cent. and Agr. Exp. Station, Univ. California, Riverside, CA 92502). **Potential residue problem associated with low volume sprays on citrus in California.** *Bull. Environ. Contam. Toxicol. 8(1): 38-45; 1972.* (5 references)

Carbaryl, chlorobenzilate, dicofol, dimethoate, dioxathion, malathion, parathion, and phosphamidon were applied at 100 gal./acre and as a dilute spray at the normal gallonage rate in a mature navel orange grove; fruit and leaf samples taken five days after application were tested for residues. Residues resulting from low volume application were less uniform than those from dilute applications, being greater at the 90° reference position than at the 0° reference position. A consistently higher amount was observed on low volume treated samples. Ratios of low volume to dilute leaf residues ranged from 1:1 with dimethoate to 31:1 with malathion. Detailed residue studies for each material to be used in low volume applications should be completed before use recommendations can be made.

73-1308. Stenersen, J.; Kvalvag, J. (Chem. Res. Lab., Norwegian College Agr., 1432 As-NLH, Norway).

Residues of DDT and its degradation products in cod liver from two Norwegian fjords. *Bull. Environ. Contam. Toxicol. 8(2): 120-121; 1972.* (3 references)

Cod from Sognefjorden, where there is considerable fruit production, contained total liver DDT residues approximately 7.5 times greater than cod from Dalsfjorden where there is no fruit growing. Average levels were 5.05 ppm for DDT, 2.67 ppm for DDE, and 1.85 ppm for TDE in cod from Sognefjorden. A lower limit of residue, dependent on the size of the fish, was apparent for Dalsfjord samples. Since DDT was banned in 1970, later studies will determine the effect of no further applications of DDT on cod residues.

73-1309. Mehendale, H. M.; Fishbein, L.; Fields, M.; Matthews, H. B. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Fate of mirex-^{14}C in the rat and plants.** *Bull. Environ. Contam. Toxicol. 8(4): 200-207; 1972.* (14 references)

More than half the mirex administered in a single oral dose of 6 mg/kg was excreted unchanged in the feces by rats within 48 hr. Total excretion levels dropped rapidly after that time and urinary levels were always low, indicating that the insecticide is readily stored in the body and slowly excreted. Less than 1% of the total dose was found in the urine in seven days and none of it had been metabolized. The first half-life was about 38 hr and the second half-life was estimated at > 100 days. Tissue and organs contained approximately 34% of the dose after seven days, all as unchanged material, and most of it was located in the fat. When mirex was incubated with liver preparations known to dechlorinate chloroform, chloroethanes, and chloropropanes, no dechlorinated products were obtained. No metabolism occurred with plant root preparations known to metabolize other organochlorines. Mirex was taken up by bean and pea roots and translocated to the aerial parts when plants were grown in water containing 1, 5, and 10 ppm mirex for two days. The results suggest that the insecticide may have an environmental half-life far greater than that of any previously studied insecticide.

73-1310. Bovey, R. W.; Baur, J. R. (Plant Sci. Res. Div., Agr. Res. Serv., Texas A & M Univ., College Station, TX 77843). **Persistence of 2,4,5-T in grasslands of Texas.** *Bull. Environ. Contam. Toxicol. 8(4): 229-233; 1972.* (7 references)

The average loss of 2,4,5-T residues on plants sprayed at 1/2 and 1 lb/acre in five locations in Texas was 98% six weeks after treatment. Over 93% was lost regardless of the amount of rainfall, suggesting that photodegradation and volatilization partially contributed to herbicide loss. Initial concentrations ranged from 26,500 ppb to 144,000 ppb depending on the native grass; after 26 weeks the former was reduced to 4 ppb and the latter to 2 ppb. Initial soil residues ranged from 1 to 5 ppm. After 12 weeks no soil residues were > 10 ppb. Little leaching was observed when samples below 6 inches could be tested. Rainfall did not appear to affect the disappearance of 2,4,5-T in soil.

73-1311. Bevenue, A.; Ogata, J. N.; Hylin, J. W. (Dept. Agr. Biochem., Univ. Hawaii, Honolulu, HI 96822). **Organochlorine pesticides in rainwater, Oahu, Hawaii, 1971-1972.** *Bull. Environ. Contam. Toxicol. 8(4): 238-241; 1972.* (10 references)

Hawaiian rainwater contained organochlorine residues in the ppt range in 1971-1972, but levels were considerably lower than those found in other areas. Values for other areas may not be totally valid for comparison since they were collected 6 to 7 yr before when pesticides were scarcely restricted. Average residues in rainfall were 3 ppt lindane, 12 ppt dieldrin, 4 ppt *p,p'*-DDT, 1 ppt chlordane, and 60 ppt polychlorinated biphenyls (PCB). Snow from Mauna Kea Summit contained 15 ppt *p,p'*-DDT, 2 ppt dieldrin, 3 ppt lindane, and 14 ppt PCB. Treatment of lumber for termite control is believed to account for the larger PCB and dieldrin levels observed near Honolulu.

73-1312. McCloskey, L. R.; Deubert, K. H. (Dept. Biol., Walla Walla College, College Place, WA 99324). **Organochlorines in the seastar *Acanthaster planci*.** *Bull. Environ. Contam. Toxicol. 8(4): 251-256; 1972.* (11 references)

Gonad tissue of the seastar *Acanthaster* collected in 1969 in the Caroline Islands contained from 0.01 to 3.89 ppm *p,p'*-DDT. Interference by what seemed to be polychlorinated biphenyls occurred in most samples. Starfish collected in 1970 to 1971 from the Mariana Islands, Caroline Islands, Marshall Islands, and Slacher's Reef and the Bunker Group were assayed with no interference and contained from 0.04 to 3.89 ppm *p,p'*-DDT and from 0.01 to 1.04 ppm dieldrin. DDE could not be quantitated. No marked correlation was observed between organochlorine residues and size of starfish populations. Age is likely to affect accumulation, but this factor cannot be determined in the seastar.

73-1313. Yadrick, M. K.; Zabik, M. E.; Funk, K. (Dept. Food Sci. Human Nutr., Michigan State Univ., East Lansing, MI 48823). **Dieldrin levels in relation to total, neutral, and phospholipid composition in selected pork muscles.** *Bull. Environ. Contam. Toxicol. 8(5): 289-293; 1972.* (14 references)

No significant differences in dieldrin levels were observed in the fat of muscles of fresh ham from hogs fed a total of 14.04 g of dieldrin; the dark adductor muscle tended to have the highest levels and the light biceps femoris muscle had the lowest. Raw adductor muscles contained 59.16 or 38.35 ppm dieldrin in the fat which was reduced to 34.5 and 35.8 ppm on

roasting. The concentration in the drip from roasting was 58.82 ppm, but most of the loss occurred through volatilization. Cooked muscles were higher in fat, probably because of loss of moisture. Light semitendinosus muscles contained significantly higher levels of total lipid than the other muscles. The level of phospholipid was significantly higher and the level of neutral lipid significantly lower in the adductor muscle than in all other muscles. The percentages of each lipid fraction were more closely related to percentage of total lipid in the muscle or animal than to muscle color. A correlation was observed between phospholipid content and dieldrin residues.

73-1314. Morgan, D. P.; Roan, C. C.; Paschal, E. H. (Community Pesticide Studies, Dept. Entomol., Univ. Arizona, Tucson, AZ). **Transport of DDT, DDE, and dieldrin in human blood.** *Bull. Environ. Contam. Toxicol. 8(6): 321-326; 1972.* (6 references)

Blood of workers long exposed to DDT and dieldrin was analyzed for these pesticides. The proportion of dieldrin found in the erythrocytes coincided with the hematocrit in 5 of the 6 workers heavily exposed to this chemical, and the plasma contained a mean level of 9 ppb. In the 10 workers with elevated DDT and DDE levels, most of the material was found in the plasma and the mean levels were 74 and 89 ppb, respectively. The 12 to 13% of each recovered in the red cells was probably associated with plasma adhering to the cells. Less than 1% of the *p,p'*-DDT or *p,p'*-DDE contained in nonlactescent serum was found in the chylomicra (free triglyceride). Essentially all of the DDT-DDE was precipitated with the protein fraction of the serum. These compounds were found principally in the triglyceride-rich low-density and very-low density lipoproteins. Results of electrophoretic separation indicate that most of the pesticide was associated with the serum albumin and to a lesser degree with β- and α_2 -globulins.

73-1315. Kuhr, R. J.; Davis, A. C.; Taschenberg, E. F. (Dept. Entomol., N. Y. State Agr. Exp. Sta., Geneva, NY 14456). **DDT residues in a vineyard soil after 24 years of exposure.** *Bull. Environ. Contam. Toxicol. 8(6): 329-333; 1972.* (4 references)

The level of DDT in the soil of a New York vineyard was monitored over a 24 year period of application. About half of the DDT applied during the first six years was recovered, and 12% of the residue was DDE, the only metabolite detected. After 24 years only 22% of the material applied could be recovered, and about 27% of the residue was DDE. At least 88% of the material taken along the drip-line was found in the top three inches of soil. Control plots contained DDT and DDE; residues were also present in the 3-6 inch layer after 24 years of spraying in nearby plots. Exposure of the soil to sunlight was increased in the vineyard by training the vines and discing the soil, which also increased exposure to microorganisms. Most of the DDT applied to this vineyard was probably either volatilized or slowly degraded to DDE.

73-1316. Albaugh, D. W. (Dept. Wildl. Fish. Sci., Texas A & M Univ., College Station, TX). **Insecticide tolerances of two crayfish populations (*Procambarus acutus*) in south-central Texas.** *Bull. Environ. Contam. Toxicol. 8(6): 334-338; 1972.* (12 references)

Crayfish populations from an area relatively free of insecticides and an area where methyl parathion, DDT, and toxaphene have been used excessively differed significantly in their responses to the three insecticides. Crayfish from the range and woodland area had 48-hr LD50s of 3.0, 2.4, and 60.7 ppb for DDT, methyl parathion, and toxaphene. The corresponding values obtained using crayfish from the treated area were 7.2, 3.4, and 90.2 ppb. Hyperactivity, loss of equilibrium and coordination, and paralysis were commonly observed prior to death. Only a few deaths were recorded among survivors of the 48-hr exposure.

73-1317. Risebrough, R. W.; Vreeland, V.; Harvey, G. R.; Miklas, H. P.; Carmignani, G. M. (Inst. Mar. Resources, Dept. Nutr. Sci., Univ. California, Berkeley, CA 94720). **PCB residues in Atlantic zooplankton.** *Bull. Environ. Contam. Toxicol. 8(6): 345-355; 1972.* (23 references)

Zooplankton lipid samples from various stations in the Atlantic Ocean consistently contained polychlorinated biphenyls in greater amounts than total DDT. PCB/DDT ratios ranged from 4.8 to $>$ 45,000. Concentrations of PCBs in zooplankton from the northwest Atlantic shelf were similar to those found in fish obtained near Great Gull Island in Long Island Sound. The median concentration was 40 ppm, higher concentrations being found in the northern areas of New York and New Jersey and in waters less than 1000 fathoms deep. In the south Atlantic there was a pronounced west-east gradient. The chlorine content of the PCBs detected was about 54%, an unexplained finding since the majority of the PCBs produced in the U.S. contains less chlorine.

73-1318. Messick, J. P. (Idaho Cooperative Wildlife Res. Unit , Univ. Idaho, Moscow, ID). **Organochlorine residues in wild ring-necked pheasants from southwestern Idaho.** *Bull. Environ. Contam. Toxicol. 8(6): 356-360; 1972.* (7 references)

DDT and its metabolites and dieldrin were the most frequently found organochlorine residues in ring-necked pheasants and eggs collected from seven farms in Canyon County, Idaho, during 1969. The mean concentrations of DDT and metabolites in areas of heavy pesticide use were 26.86 ppm in adipose tissue, 1.17 ppm in liver, and 6.88 ppm in eggs. The respective values for dieldrin were 0.78, 0.05, and 0.23 ppm. In the areas of

no pesticide use an average of 4.70 ppm total DDT was detected in adipose tissue. Trace amounts of BHC, lindane, heptachlor, heptachlor epoxide, aldrin, and endrin were found in some adipose tissue and egg samples. Within a nest, eggs sometimes contained different pesticides and widely divergent amounts of the same pesticides. Pheasant foods contained low levels of the pesticides in both heavy use and non-use areas. An average of 3.4 ppm combined residues was found in soil from the heavy use area. The samples from no-pesticide use areas contained an average total residue of 1.12 ppm.

73-1319. Ware, G. W.; Estesen, B.; Cahill, W. P. (Dept. Entomol., Univ. Arizona, Tucson, AZ). **Organophosphate residues on cotton in Arizona.** *Bull. Environ. Contam. Toxicol. 8(6): 361-362; 1972.*

Cotton plants sprayed with one of four organophosphate insecticides were monitored for residues up to 96 hr after application. Initial and final residues were 106 and 3.9 ppm methyl parathion, 117 and 5.5 ppm ethyl parathion, 40.2 and 9.0 ppm azinphosmethyl, and 196 and 71.1 ppm monocrotophos, the latter two values being unexpectedly high. Final levels of the oxon after ethyl and methyl parathion application were 0.58 and 0.02 ppm. Application rates were 1.0 lb/A for methyl parathion, ethyl parathion, and monocrotophos and 0.5 lb/A for azinphosmethyl. Since the residues were determined on a ppm basis, the data is not directly related to the portion which can be removed on the hands or clothing of workers.

73-1320. Markin, G. P.; Ford, J. H.; Hawthorne, J. C. (U.S. Dept. of Agr., APHIS, Plant Protect. & Quarantine Programs, Gulfport, MS 39501). **Mirex residues in wild populations of the edible red crawfish (*Procambarus clarki*).** *Bull. Environ. Contam. Toxicol. 8(6): 369-374; 1972.* (10 references)

Crayfish from harvest areas which had been sprayed from one to seven times with mirex contained either no residues of the pesticide or residues of from 0.01 to 0.04 ppm, below the lethal level in juvenile crayfish. In the locations where reduced populations were reported no mirex was detected in the crayfish. Aldrin, dieldrin, and endrin could not be determined in the procedure employed. DDT was found in all of the samples and polychlorinated biphenyls and chlordane were observed occasionally. The analytical procedure utilized electron capture GC, and recoveries ranged from 75 to 80%.

73-1321. Beynon, K. I.; Bosio, P.; Wright, A. N. (Anal. Chem. Div., Shell Res. Ltd., Woodstock Agr. Res. Cent., Sittingbourne, Kent, England). **Absence of residues from crops irrigated with water treated with trifenmorph for schistosomiasis control.** *Bull. WHO 46(6): 761-764; 1972.* (5 references)

The fate of the molluscicide trifenmorph (*N*-tritylmorpholine) following its use in irrigation systems to control the intermediate hosts of schistosomes was studied by laboratory and field experiments. Laboratory studies with ^{14}C-trifenmorph indicated that bean plants did not take up detectable residues when the soil in which they were grown was irrigated with water containing trifenmorph in concentrations likely to occur in the field. These laboratory studies have been complemented by field irrigation studues of growing crops in southern Africa and the Sudan. Residues of trifenmorph and its breakdown product triphenylmethanol could not be detected in the crops and the limit of detectability was 0.01-0.02 ppm. These results indicate that residues are not likely to be present in irrigated crops following the treatment of the irrigation water systems with trifenmorph. (Author abstract by permission)

73-1322. Mestres, R.; Heurteaux, P.; Vaquer, A.; Illes, S. (Fac. de Pharm. de Montpellier, Montpellier, France). **Incidence des therapeutiques agricoles sur la pollution du milieu aquatique. [Influence of agricultural pesticides on aquatic environment.]** *Cah. Nutr. Diet. 7(4): 277-279; 1972.* (1 reference) (French)

Pesticide residue determinations in waters and biomasses from the Camargue marshland preserve are presented. The combined yearly pesticide consumption in the preservation area is 310 to 360 tons. A multiple gas-chromatographic method was applied for residue determination. The α- and γ-BHC concentrations in water ranged from 0.002 to 0.14 mg/m^3 and the PCB residues from 0.1 up to 8 mg/m^3. The parathion residues varied from 0.001 to 0.12 mg/m^3. Polychlorocamphene (toxaphene), methyl parathion, DDT, fenitrothion, diethion, and azinphosmethyl were detected temporarily in some water samples. Aquatic plants contained pesticide residues about 10 to 400 times higher in concentration than those determined in water. Sediments and muds contained 0.37 mg of polychlorocamphene, 0.006-0.04 mg of PCB, and 0.00012-0.009 mg of parathion per kg. Gull eggs contained 0.15 mg of γ-BHC, 5.7 mg of DDT, 3.8 mg of DDE, 0.8 mg of PCB, and 22 mg of polychloro-ter-phenyl per kg. Carp contained 0.03 mg of α-BHC, 0.01 mg of γ-BHC, 0.05 mg of δ-BHC, 0.02 mg of DDE, 2 mg of PCB, and 0.03 mg of dieldrin per kg.

73-1323. Boggess, Jr., T. S.; Cecil, S. R.; Shewfelt, A. L. (Dept. Food Sci., Georgia Station, Experiment, GA 30212). **Effect of soil-incorporated pesticides on the organoleptic qualities of baked sweet potatoes.** *Ga. Agr. Res. 14(1): 3-4; 1972.* (2 references)

Organoleptic tests were conducted on sweet potatoes grown after soil application of KN_3, Vernam, or KN_3 plus Vernam. Although differences were apparent, they were not enough to alter substantially the quality of the baked potatoes in comparison with untreated controls. A slight bitter flavor and lighter color were ob-

served in uncured Vernam-treated samples. Vernam treatment was rated consistently poorer than the other treatments. Certain herbicides, provided they are properly selected and applied, can be used without serious detriment to the qualities of the potatoes.

73-1324. Oldfield, J. F. T. (Brit. Sugar Corp. Res. Labs., Colney, Norwich, England). **General review of problems of pesticide residues.** *IIRB Inst. Int. Rech. Betteravieres 6(1): 15-18; 1972.*

Fungicides, nematicides, herbicides, and insecticides are essential for the successful production of sugar beets in the United Kingdom, but trace residues are not necessarily a problem. The contribution of seed dressings to the final pesticide residue is slight since the weight of the root is about 25,000 times that of the seed. Controlled use of herbicides and insecticides insures residues not exceeding safe limits, and processing into sugar generally eliminates remaining residues through degradation or salt formation.

73-1325. Klein, W.; Kohli, J.; Weisgerber, I.; Korte, F. (Inst. fuer Oekologische Chemie der Gesellschaft fuer Strahlen- und Umweltforschung mbH., Munich, Germany). **Fate of aldrin-^{14}C in potatoes and soil under outdoor conditions.** *J. Agr. Food Chem. 21(2): 152-156; 1973.* (26 references)

Aldrin-^{14}C has been applied to soils under outdoor conditions in Germany (2.9 kg/ha) and England (3.2 kg/ha) and potatoes have been sown. At harvest, more than 60% of the total radioactivity recovered from the soil and plants was due to metabolites, mainly dieldrin and a group of hydrophilic products, of which the main compound was identified as dihydrochlordene-^{14}C dicarboxylic acid (1,2,3,4,8,8-hexachloro-1,4,4a,6,7,7a-hexahydro-1,4-*endo*-methyleneindene-5,7-dicarboxylic acid). Photodieldrin-^{14}C was also detected in small amounts in the potato haulm from England, as were traces of photoaldrin-^{14}C in both soils. The conversion of aldrin-^{14}C was least in the upper soil layer and greatest in deeper soil layers (10-60 cm from surface) and in the plants. Only very low residues were detected in the deeper soil layers in England, whereas more radioactivity was found in the deeper soil samples in Germany. The leaching water of the experiment in Germany contained only dihydrochlordene-^{14}C dicarboxylic acid (0.02 ppm). (Author abstract reprinted by permission of the American Chemical Society)

73-1326. Tanaka, F. S.; Wien, R. G. (Plant Sci. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Metabolism and Radiation Res. Lab., Fargo, ND 58102). **Hydrolysis of aqueous solutions of sodium 2,2-dichloropropionate under self-induced alkaline conditions.** *J. Agr. Food Chem. 21(2): 285-288; 1973.* (12 references)

Aqueous solutions of sodium 2,2-dichloropropionate were previously reported as having an approximate pH of 5 to 6. The data obtained in this study show that freshly prepared solutions of greater than about 0.9 *M* concentration exhibit a basic pH. Upon standing, however, these salt solutions become acidic due to the hydrolysis of the 2,2-dichloropropionate to yield pyruvate and hydrochloric acid. The approximate pH of the sodium 2,2-dichloropropionate solutions is estimated at different concentrations, and the rates of pH change due to hydrolysis are reported for a dilute, intermediate, and high concentration of material under mildly alkaline conditions. (Author abstract reprinted by permission of the American Chemical Society)

73-1327. Woodham, D. W.; Edwards, R. R.; Reeves, R. G.; Schutzmann, R. L.; (U.S. Dept. of Agr., Anim. and Plant Health Inspection Serv., Plant Protection Program, Brownsville, TX 78520). **Total toxic aldicarb residues in soil, cottonseed, and cotton lint following a soil treatment with the insecticide on the Texas high plains.** *J. Agr. Food Chem. 21(2): 303-307; 1973.* (8 references)

Aldicarb residues in soil, cottonseed, and cotton lint following an in-furrow soil application of 15 lb/acre of a 10% granular formulation of the insecticide on the Texas High Plains were investigated by a gas chromatographic-flame photometric detection procedure. Aldicarb residues (as the sulfone) as high as 1.65 ppm (average of three laboratories) were detected in soil from dryland fields three days following application, decreasing to 0.24 ppm in one month and completely disappearing in four months. Residues in soil from irrigated fields averaged as much as 0.70 ppm 13 days after treatment and had completely disappeared in 42 days. Residues detected in postharvest cotton from dryland plots averaged 0.07 ppm in the seed and 0.05 ppm in the lint. Postharvest cotton from irrigated fields showed average residues of 0.01 ppm in the seed and 0.01 ppm in the lint. No significant residues were detected in soil between treated rows or in adjacent untreated areas. (Author abstract reprinted by permission of the American Chemical Society)

73-1328. Dennis, N. M.; Eason, G.; Gillenwater, H. B. (Market Quality Res. Div., Agr. Res. Serv., U.S. Dept. Agr., Savannah, GA). **Formation of methyl chloride during methyl bromide fumigations.** *J. Econ. Entomol. 65(6): 1753-1754; 1972.* (4 references)

An unidentified peak was detected just preceding the methyl bromide peak on gas chromatograms of hard-wheat flour fumigated with methyl bromide. This peak grew larger with increasing time after fumigation, and the methyl bromide peak decreased proportionately. After nine days only a trace of methyl bromide remained, and the new peak approximated the size of the original methyl bromide peak. Similar results were obtained with whole wheat flour, toasted wheat germ,

soft wheat, cornmeal, and corn, whereas the secondary gas failed to form in whole or shelled peanuts, soybeans, and black-eyed peas. The secondary gas was identified as methyl chloride by IR spectrometry, mass spectrometry, and GC analysis with respect to an authentic methyl chloride sample. Depending on the field or laboratory analysis used, the methyl chloride formed after fumigation with methyl bromide might be overlooked or determined as methyl bromide. The amount of methyl chloride formed in 24-hour fumigations would generally be small. The mammalian toxicity of methyl chloride is lower than that of methyl bromide.

73-1329. Tappan, W. B.; Wheeler, W. B.; Lundy, H. W. (Agr. Res. and Educ. Cent., IFAS, Univ. of Florida, Quincy, FL 32351). **Methomyl residues on cigar-wrapper and flue-cured tobaccos in Florida.** *J. Econ. Entomol. 66(1): 197-198; 1973.* (4 references)

Residues of methomyl applied as dust and spray on Florida cigar-wrapper and flue-cured tobaccos, respectively, at various rates and intervals prior to harvest were determined by gas chromatography. Mean residues in ppm ranged from 3.87 to 103.30 on cigar-wrapper and from 0.00 to 0.25 on flue-cured tobacco. Relatively low temperatures during curing (90-95°F) and fermentation (114°F) of cigar-wrapper tobacco apparently caused little residue loss. Weathering and increasing time intervals from last application to harvest materially reduced residues on both tobaccos. Although there is a high methomyl residue on cigar-wrapper tobacco when used as described, it could be reduced by alternating methomyl with less-persistent pesticides in early season applications and by using other means of control during the harvest period. (Author abstract by permission)

73-1330. Eschle, J. L.; Oehler, D. D.; Hogan, B. F.; Ivey, M. C. (Entomol. Res. Div., Agr. Res. Serv., U.S. Dept. Agr., Kerrville, TX 78028). **Coumaphos on cable-type backrubbers. Control of horn flies and determination of residues in milk of dairy cattle.** *J. Econ. Entomol. 66(1): 290-291; 1973.* (3 references)

Cable-type backrubbers, similar to the type used by dairymen for treating their cattle, were constructed by wrapping chain with burlap, then treating the burlap with 1% or 2% solutions of coumaphos in fuel oil. Lactating dairy cows were treated with the backrubbers 4 times a day for 14 days, then the insecticide replenished and the treatments repeated. Aliquots of morning and evening milkings were combined in proportion to the quantity of milk obtained at each milking. Control of horn flies, tested by bioassay, was essentially complete during the 4-week test period. No residues of coumaphos were detected in milk samples taken 1,3,5,7,10, and 14 days after each treatment of the backrubbers with insecticide.

73-1331. Hara, A.; Iwasaki, I.; Nawa, H.; Yoshioka, Y.; Yokoo, S. (Second Sch. of Intern. Med., Fac. of Med., Osaka Univ., Okayama, Japan). **[Organochlorine insecticide residues in the blood of pregnant women and in umbilical cord blood.]** *Igaku No Ayumi (Progr. Med.) 84(2): 79-80; 1973.* (4 references) (Japanese)

All examined blood specimens from pregnant women and all specimens of umbilical cord blood contained α- -, β-, and γ-BHC (lindane), as well as *p,p'*-DDT and its metabolites. Maternal blood contained an average of 0.0025 ppm α-BHC, 0.028 ppm β-BHC, 0.0021 ppm γ-BHC, 0.112 ppm *p,p'*-DDT, 0.0156 ppm *p,p'*-DDE, 0.0035 ppm *p,p'*-DDD (TDE), and 0.0021 ppm *o,p*i-DDT. Umbilical cord blood contained an average of 0.0048 ppm α-BHC, 0.0110 ppm β-BHC, 0.0027 ppm γ-BHC, 0.0089 ppm *p,p'*-DDT, 0.0061 ppm *p,p'*-DDE, 0.0030 ppm *p,p'*-DDD, and 0.0020 ppm *o,p'*-DDT. These values were generally higher than the corresponding average values for Japan. The β-isomer of BHC accounts for 85% of the total BHC in the blood of pregnant women and 65% of the total BHC in the umbilical cord blood. The fraction of α-BHC in umbilical cord blood is twice as great as that in maternal blood. Approximately two thirds of the DDT and BHC and one third of the DDE in the mother's body apparently translocate into the body of the fetus.

73-1332. Rautapaa, J.; Siltanen, H.; Valta, A. L.; Mattinen, V. (Agr. Res. Cent., Dept. Pest Infestation, Tikkurila, Finland). **DDT, lindane and endrin in some agricultural soils in Finland.** *Maataloustieleelinen Aikak. 44(4): 199-206; 1972.* (5 references)

Soil samples (top 20 cm) taken from areas where DDT, endrin, or lindane had been used for a long time in large amounts and samples from an area where none had been used were analyzed for pesticide residues. The average total DDT content was 0.73 ppm and the maximum value was 2.35 ppm. The ratio of *o,p'*-DDT to *p,p'*-DDT reflected that of the commercial preparations, and DDE accounted for about 5% of the total. Of the total amount of DDT applied to an area, an average of 21% remained. Lindane was detected in all samples and the maximum level in the soil was 0.8 ppm. From 5 to 100% of the amount of lindane known to have been applied to soil remained. From 0 to 50% of the endrin applied to the four gardens tested remained. Although Finnish soil is frozen for six months of the year and dissolution, transport, and evaporation of pesticides is negligible during that time, the results of the present study do not suggest a high rate of accumulation of DDT in the soil.

73-1333. Rasulev, B. D.; Tashbekov, T. U. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Diseases, USSR). **Pestitsidy, mineral'nyye udobreniya i kachestvo plodov yabloni. [Pesticides, inorganic fertilizers and the quality**

of apples.] *Med. Zh. Uzb. 5: 24-26; 1972.* (Russian)

The effects of phosalone and anthio (formothion) with and without ammonium nitrate, superphosphate, and potassium chloride were studied on the vitamin C and sugar contents in apples; the dynamics of pesticide decomposition as affected by inorganic fertilizers was also investigated. Anthio and phosalone were used separately or in combination in the form of 0.2-0.15%-solution at an expenditure of 10 liter/tree. The phosalone residue in apples was 0.08 mg/kg 56 days after spraying; no traces of anthio were detected. Both pesticides were detoxified more rapidly when applied to fertilized trees; only 0.032 mg of phosalone per kg and no anthio were determined 40 days after treatment. Both pesticides suppressed vitamin C and sugar synthesis in the fruits, especially of non-fertilized trees, and the suppression was followed by an increase in the vitamin C and sugar contents between the 56th and 71st days. The suppression of the vitamin C and sugar synthesis was due to the inhibition of the redox processes. The vitamin C and sugar contents in apples from phosalone-treated, fertilized trees were up by 35 and 22%, respectively, and the corresponding increase for anthio with and without fertilization was 5-8%.

73-1334. Pulatov, B. A. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Diseases, USSR). **Vliyaniye Kil'valya na kachestvo pishchevykh produktov. [Influence of the pesticide Kilval on the quality of vegetables.]** *Med. Zh. Uzb. 5: 29-31; 1972.* (Russian)

The influence of the pesticide Kilval (Vamidothion) was studied on the organoleptic properties and vitamin C, total sugar, monosaccharide, and microelement concentrations in pepper, cucumber, and tomato. The patches were treated with 0.15, 0.2, and 0.3% preparations from 40% emulsion at different expenditures. No deterioration of the organoleptic properties of ripe fruits was determined. The Kilval residue concentrations in fruits were dependent on the time of application, on the concentrations, and expenditure. Following application of 1.5-1.0 kg of 0.15-0.2% Kilval per ha, the residue levels in pepper, tomato, and cucumber were 1.92-1.53, 1.21-0.92, and 2.06-1.48 mg/kg, respectively. No residues were detected 35-40 days after Kilval application. The half-life period of 0.1, 0.15, 0.2, and 0.3% Kilval in pepper, tomato, and cucumber was determined in the ranges of 16.11-19.25, 12.60-20-38, and 11.65-20.38 days. The vitamin C content in peppers treated with 0.1-0.3% Kilval 35-45 days earlier was about the same as in the control, sometimes higher. Kilval suppressed the formation of sugar, monosaccharides, and microelement traces in treated vegetables. Kilval is not recommended for use in a concentration of 0.3%.

73-1335. Steinbeiss, C.D.; Peisker, K.; Drauschke, W.; Schulz, H. (Fachbereich "Spezielle Gebiete," Martin-Luther Univ. Halle-Wittenberg, Halle-Wittenberg, DDR). **Untersuchungen ueber den Einsatz von 14C-markiertem Chlorpropham (Isopropyl-(1,3-14C)-*N*(3-chlorphenyl)-carbamat) bei der Lagerung von Kartoffeln, Moehren und Zwiebeln. 1. Mitt. Untersuchungen zum Penetrationsvermoegen und zur Rueckstandsproblematik von 14C-markiertem Chlorpropham bei Applikation in fumiganter Form. [Studies on the use of carbon-14-labeled chlorpropham (isopropyl-(1,3,-14C)-*N*-(3-chlorophenyl) carbamate) in the storage of potatoes, carrots, and onions. Part I. Investigations of the penetrating power of carbon-14-labeled chlorpropham and of problems concerned with residues resulting from its use in fumigation.]** *Nahrung 16(1): 27-36; 1972.* (German)

The effects of varying storage temperatures and ventilation intensities on chlorpropham residues were studied by autoradiography in carrots, onions, and potatoes fumigated with 10 g of chlorpropham per ton. The ventilation intensity had practically no influence on the residues in the skin; residue levels in the tubers increased with time. The average chlorpropham content in peeled potatoes amounted to 0.55 ppm in five months. The residue concentration in the skin of untreated potatoes stored with treated potatoes increased to 0.65 ppm, but sprouting inhibition was unsatisfactory. Untreated carrots and onions absorbed chlorpropham from its gaseous phase. Penetration of chlorpropham into intact onions, unlike into carrots, was negligible.

73-1336. Peisker, K.; Steinbeiss, C. D.; Drauschke, W.; Schulz, H. (Zentrallab. der Sektion Pflanzenproduktion, Martin-Luther-Univ. Halle-Wittenberg, Halle-Wittenberg, DDR). **Untersuchungen ueber den Einsatz von 14C-markiertem Chlorpropham (Isopropyl-(1,3-14C)-*N*(3-Chlorphenyl)-carbamat) bei der Lagerung von Kartoffeln, Moehren und Zwiebeln. 2. Mitt. Makroautoradiographische Untersuchungen der mit 14-C-markiertem Chlorpropham behandelten Kartoffeln, Moehren und Zwiebeln. [Studies on the use of carbon 14-labeled chlorpropham (isopropyl-(1,3-14C)-*N*-(3-chlorophenyl)-carbamate) in the storage of potatoes, carrots, and onions. Part II. Macro-autoradiographic examinations of potatoes, carrots, and onions treated with carbon-14-labeled chlorpropham.)** *Nahrung 16(1): 37-45; 1972.* (7 references) (German)

Penetration and residue contents in potatoes, carrots, and onions fumigated with ^{14}C-labeled chlorpropham were studied macroautoradiographically. Chlorpropham was equally distributed over the total surface of the crops with especially high concentrations at the vegetal points (eyes). Radioactivity gradually increased in untreated potatoes, carrots, and onions stored with treated tubers, indicating continuous evaporation of the active agent. A slight degree of penetration of chlorpropham into the tubers, possibly starting from the vegetal points, was determined after five months' storage. Chlorpropham accumulated in the vascular ring

of carrot. The occurrence of radioactivity in punctures and bruises indicates absorption from the gaseous phase. Chlorpropham was absorbed by onions, although less markedly than in potatoes and carrots.

73-1337. Koudela, S.; Cieleszky, V. (Budapest, Hungary). **Veraenderungen von CCC Rueckstaenden waehrend der Vegetationsperiode sowie bei der Verarbeitung in der Muehlenindustrie. [Changes in CCC residues during the growing season and during processing in the milling industry.]** *Nahrung 16(1): 55-56; 1972.* (1 reference) (German)

Preliminary studies on the use of chlormequat chloride (CCC) for wheat growing in Hungary revealed that if CCC is applied at 4 or 6 kg/ha in April or May, the residues at harvest are below 0.5 ppm. In subsequent studies following application of 1.5-3.0 kg/ha, residues of about 0.5 ppm were detected. When fields were treated on June 15, 1970, with an excessive amount (5.8 kg/ha), the grain harvested four weeks later contained 15-20 ppm CCC. The CCC content of flour produced from this wheat was only 0.2-0.5 ppm. For analysis, wheat samples were extracted with ethanol and the extract cleaned up by column chromatography on Dowex 50. Chlormequat chloride was separated from choline on sodium chloride-impregnated filter paper using a mixture of isoamyl alcohol, *n*-propyl alcohol, and saline solution as the mobile phase. Potassium iodoplatinate was used as the chromogenic reagent. CCC could also be eluted with acetone and determined photometrically after reaction with dipicrylamine. The limit of detection was 0.2-0.5 ppm, and the recovery rate 60-80%. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1338. Tarjan, R. (Inst. fuer Ernaehrungswiss., Budapest, Hungary). **Fremdstoffe in menschlichen Organen und Geweben als Indikator der Umweltverschmutzung. [Foreign materials in human organs and tissues as indices of environmental pollution.]** *Nahrung 16(2): 125; 1972.* (German)

Many environmental contaminants, including some pesticides, accumulate preferentially in animal organs and tissues. Lipid-soluble substances such as organochlorines accumulate in adipose tissues. The assumption that the placenta represents a barrier to halt transport of substances between mother and fetus was contradicted by the discovery of DDT and other organochlorines in the tissues of aborted fetuses and stillborn infants. It was also assumed that harmful substances would not be transferred from mother to infant through the milk; however, human milk has also contained appreciable quantities of pesticides. Data collected since 1960 on DDT storage in adipose tissues in Hungary revealed a rough parallel between DDT levels in tissue and DDT use in agriculture. The major portion enters the human body via foods of animal origin. The use of DDT was strictly limited in Hungary in 1968 and prohibited completely in 1969. A considerable decrease in the DDT content of human tissues has already occurred, and a gradual transformation of DDT to DDE and DDD (TDE) has been observed. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1339. Acker, L.; Schulte, E. (Inst. fuer Lebensmittelchem., Univ. Muenster, Germany). **Zum Vorkommen von Hexachlorbenzol und polychlorierten Biphenylen neben chlorierten Insektiziden in menschlichem Fettgewebe und in Humanmilch. [Occurrence of hexachlorobenzene and polychlorinated biphenyls as well as chlorinated insecticides in human adipose tissue and milk.]** *Nahrung 16(2): 130; 1972.* (German)

DDT, DDE, BHC, dieldrin, and heptachlor epoxide were detected in human adipose tissue and milk samples from residents of the Muenster area. Some overlapping peaks in the gas chromatograms of the samples were identified as polychlorinated biphenyls. The quantities of PCBs present in milk and tissue samples were approximately equal to those of DDT. The concentration of hexachlorobenzene in the samples was also in the same order of magnitude as the total DDT level. (Lecture presented at symposium on nutrition and health, see abstract 73-1287).

73-1340. Engst, R.; Knoll, R. (Zentralinst. fuer Ernaehrung, Potsdam-Rehbruecke, DDR). **DDT- und DDE-Rueckstaende in Humanmilch. [DDT and DDE residues in human milk.]** *Nahrung 16(2): 130-131; 1972.* (German)

DDT and DDE residues were determined in 75 pooled milk specimens and two individual specimens in the DDR in 1969 and 1970. The limit of detection of the thin-layer chromatographic test method used was 0.05 ppm; only three of the samples contained no detectable residues. The 1969 samples (total 57) contained an average of 0.07 ppm *p,p'*-DDT and 0.14 ppm *p,p'*-DDE (0.23 ppm total DDT) and the 1970 samples (18 total) averaged 0.05 ppm *p,p'*-DDT and 0.10 ppm *p,p'*-DDE (0.16 ppm total DDT). The individual milk samples contained 0.25 and 0.41 ppm total DDT. On the average, human milk contains at least ten times as much DDT as cow's milk. Traces of *p,p'*-DDD (TDE) were also sometimes observed. Polychlorinated biphenyls were also presumptively identified in the human milk samples. (Lecture presented at symposium on nutrition and health, see abstract 73-1287).

73-1341. Szokolay, A. (Hyg. Res. Inst., Bratislava, Czechoslovakia). **Ueber die Dynamik der Insektizidrueckstaende in Lebensmitteln. [Dynamics of insecticide residues in foods.]** *Nahrung 16(2): 131; 1972.* (German)

Of the various types and sources of pesticide

residues in foods in Czechoslovakia, the BHC contents in butterfat and eggs and the changes produced in them during processing are particularly significant. Model experiments with heptachlor have revealed accumulation of residues in crops after treatment of soil used for growing beets, corn, and wheat, and dietary uptake of these residues by animals. Organochlorine pesticides reacted with carotinoids in a variety of solvents and in fats or fatty acids after several days of incubation at 37°C. Residues of parathion and other organophosphate insecticides in canned citrus juices are primarily degraded via reduction of the nitro group by tin from the cans. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1342. Adamovic, V.; Sokic, B.; Petrovic, O. (Inst. fuer Gesundheitsschutz, Belgrade, Yugoslavia). **Zum Vorkommen von chlororganischen Insektiziden im Organismus von Neugeborenen. [Occurence of organochlorine insecticides in newborns.]** *Nahrung 16(2): 131; 1972.* (German)

In the course of studies on environmental pollution by persistent pesticides, relatively large quantities of DDT and its derivatives were found in brain and adrenal tissues of newborns. Further studies were conducted to determine the origin and route of penetration of these substances into the fetus and the quantities ingested by babies via their mothers' milk. The results were compared with the data obtained for the population of Belgrade as a whole. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1343. Romminger, K.; Kubel, D. (Zentrale Lebensmittelhygienische Untersuchungsstelle, Berlin, DDR).1 **Beitrag zur Rueckstandsdynamik von Phosphorwasserstoff in Lebensmitteln. [Residue dynamics of phosphine in foods.]** *Nahrung 16(2): 131-132; 1972.* (German)

Walnuts, hazelnuts, Brazil nuts, almonds, apricot seeds, cocoa beans, cashew and palm kernels, poppyseeds, lima beans, lentils, tobacco, raisins, dried apricots, cinnamon, black pepper, and powdered milk were fumigated with phosphines. Samples were taken for analysis at intervals up to 21 days after treatment and phosphine residues determined colorimetrically. Untreated samples gave appreciable blank values. By 14 days after treatment, all foods tested were free from excessive phosphine residues (residues undetectable or below the established tolerance limit of 0.01 ppm) except for Brazil nuts. Between 0.03 and 0.1 ppm of phosphine was still present in Brazil nuts after 21 days of storage at room temperature. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1344. Heinisch, E. (Inst. fuer Pflanzenschutzforsch., Kleinmachnow, DDR.) **Herbizid-Rueckstaende in Lebensmitteln pflanzlicher Herkunft. [Herbicide residues in foods from plants.]** *Nahrung 16(2): 132; 1972.* (German)

The possibilities for contamination of plant crops by herbicides were discussed in a literature review. Residues of DNOC and chlorates were found in crops after defoliation and desiccation treatment, and residues of triazines were found after soil treatment in carrots (intended for use as baby food), in the herbs marjoram and balsam, and in the medicinal plants peppermint, sage, thyme, and digitalis. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1345. Cerna, V.; Benes, V. (Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Fenitrothionrueckstaende auf Obst und Gemuese. [Fenitrothion residues in fruits and vegetables.]** *Nahrung 16(3): 179-186; 1972.* (20 references) (German)

Fenitrothion residues in treated apples, plums, and lettuce were determined by spectrophotometry and cholinesterase activity inhibition methods. Extraction by means of petroleum ether and evaporation were followed by application of the residue to alumina layer and development by means of carbon tetrachloride and acetone for UV spectrophotometric determination. The sensitivity of the less specific enzymatic method was increased thorugh oxidation of fenitrothion with hydrogen peroxide and glacial acetic acid. After a single application of a 0.2% spray, the fenitrothion residues decreased to 0.5 ppm in 20, 23, and 12.5 days, respectively. The 3-methyl-4-nitrophenol residue, a metabolite of fenitrothion, was in an order of magnitude of 0.1 ppm, accounting for some 10% of the fenitrothion content. The 3-methyl-4-nitrophenol concentration did not increase markedly with time.

73-1346. Thurm, V.; Fensterer, C. (Hygiene-Institut Wernigerode, Wernigerode, DDR). **Untersuchungen ueber Pestizidrueckstaende auf Tabakwaren. 1. Mitt. Zum Gehalt unserer Tabakerzeugnisse an chlorierten Kohlenwasserstoffen. [Studies of pesticide residues on tobacco products. Part I: On the organochlorine pesticide contents in East German tobacco products.]** *Nahrung 16(4): 353-358; 1972.* (2 references) (German)

Organochlorine pesticide residues were determined by thin-layer chromatography in pipe tobacco, cigarettes, and cigars marketed in East Germany. The tobacco products contain an average of 90% imported tobacco. Except for two pipe tobacco samples, all 34 pipe tobacco, cigarette, and cigar samples contained organochlorine pesticide residues such as DDT, DDE, methoxychlor, endosulfan, BHC, or endrin. The DDT and DDE residues in various brands of pipe tobacco ranged from 0.38-8.0 ppm and 0.38-0.55 ppm. The DDT contents in 14 different brands of cigars ranged from 1.3 to 20 ppm, with methoxychlor residues of 0.50 and 0.8

ppm in two, and 0.85 ppm of endrin in one sample. The total DDT content in 12 brands of cigarettes varied from 0.5 to 1.5 ppm. The endosulfan contents ranged from 0.25 to 1.25 in five samples. A BHC level of 1.25 ppm was determined in one sample. The DDT contents were highest mainly in cigars and tobaccos from South and Central America.

73-1347. Pfeifer, G.; Flora, T. (Author address not given). **A dazomet hatoanyag termikus bomlasa. [Thermal decomposition of dazomet.]** *Nehezvegyip. Kut. Intez. Kozlem. 4: 175-178; 1972.* (8 references) (Hungarian)

The decomposition of dazomet was studied by derivatographic analysis. Following melting, the decomposition progresses in two distinct steps with the respective peak temperatures of 185 and 235° C. The first step, a first order reaction, yielded methylisothiocyanate. The second-step reaction was of 0.3 order. The decomposition of dazomet was completed at 320 C. The fungicidal effect of dazomet is most probably due to the formation in the soil of methylisothiocyanate.

73-1348. Hughes, J. T. (Chem. Div., DSIR, Petone, New Zealand). **Spray residues in fruit and vegetables.** *N. Z. J. Agr. 125(6): 60-63; 1972.*

About one third of the samples of fruit and vegetables taken at random in New Zealand since 1964, mainly from retail outlets, contained detectable pesticide residues. Procedures have been refined and new methods introduced during the course of these investigations. Residues in the pip fruit and stone fruit were highest, reflecting the intensive spray programs used. Maximum concentrations found in these fruits were 3 ppm DDT, 1-2 ppm TDE, 1 ppm tetradifon, 1 ppm dicofol and 0.1-0.2 ppm lindane. Only two samples contained residues above prevailing tolerances. The results reveal no serious contamination of fruits and vegetables, but suggest that misuse or relaxation of control on the part of the grower could lead to excessive residues. Methods are available to prevent this and for appropriate action.

73-1349. Horubala, A.; Hoser, A. (Inst. of Food Technol., Agr. Acad. Warsaw, Poland). **Zawartosc pestycydow chloropochodnych w niektorych owocach i warzywach na rynku warszawskim. [Contents of chlorine derived pesticides in certain fruits and vegetables on the Warsaw market.]** *Przem. Spozyw. 26(12): 543-544; 1972.* (3 references) (Polish)

Using thin layer chromatography, residues of lindane, DMDT (methoxychlor), DDD (TDE), DDE, DDT, and total DDT were determined in 11 samples each of frozen plums, frozen peas, and fresh apples and cabbage. No residues were detected in approximately 18% of samples. Total DDT ranged from 0-0.046 ppm in plums, 0-0.013 ppm in peas, 0-0.020 in apples, and 0-0.030 in cabbage. DDE residue was most frequently detected (58% of the samples). Methoxychlor was not detected in any of the samples. The detected amounts are well below the allowed limits and smaller than those reported in previous years.

73-1350. Carrasco, J. M.; Cunat, P.; Martinez, M.; Primo, E. (Inst. de Agroquim. y Technol. de Alimentos y Catedra de Quim. Agr. de la Escuela Tech. Sup. de Ingenieros Agron. de Valencia, Valencia, Spain). **Contaminacion por plaguicidas de alimentos constituyentes de la dieta media espanola. [Pesticide contamination of average Spanish diet food constituents.]** *Rev. Agroquim. Technol. Aliment. 12(3): 463-476; 1972.* (9 references) (Spanish)

Food constituents of the average Spanish diet were collected and analyzed for pesticide residues. The foods were taken from the Valencia market which is supplied by products from heavily sprayed agricultural areas. Dairy products, meat, eggs, baked goods, and beverages were homogenized in proportions representing the average composition of the daily diet while fruits and vegetables were analyzed individually. BHC contamination ranged from non-detectable (apples and grapes) to 0.150 ppm in molten hog lard. DDT reached 0.200 ppm in fats. The maximum *p,p'*-DDE levels of 0.026 and 0.635 ppm were found in dairy and meat samples, and the largest *p,p'*-DDT residues of 0.845 and 0.566 ppm were found in meat and egg samples. Eighty percent of the dairy products, 100% of the meat and fat products, 90% of the eggs and fish, 50% of the olive oil, 90% of the baked goods, 75% of the cereal, and 80% of the raw vegetables tested were pesticide-contaminated. Malathion was detected only in traces in some olive oil, pear, and apple samples. Kelthane (dicofol) and Tedion (tetradifon) reached only 0.200 ppm in some fruit and vegetable samples. Water and flavored beverages were not contaminated and only 10% of the alcoholic beverages had traces of pesticide residues. Daily DDT ingestion (including *o,p'*-DDT, *p,p'*-DDT and *p,p'*-DDE) per consumer is estimated as 78 μg with 13.8 μg lindane in Spain.

73-1351. Maki, S. (Ass. of Chem. for Forestry, Tech. Committee, Japan). **[Pesticides and their toxicities. Part 4. Determination of residual life span of sodium chlorate in soil by biometry.]** *Ringyo To Yakuzai (Forest. Forest Chem.) 43: 14-16; 1973.* (Japanese)

Two series of bioassays were conducted on the residual life of sodium chlorate. In the first series of tests sodium chlorate soluble (a.i. of 97%) and sodium chlorate dust (a.i. of 90%) were applied at the rate of 1000 g and 1200 g/are to the soil surface of 1/5000 are pots kept in a green house on June 7 and July 6. Thirty grains of wheat were sown in the upper, middle, and lower part of the soil of the treated pots on November

17. The germination, height, and wet and air dried weights of the plant were measured on December 8 and compared to those of the plants sown on the untreated soil. The differences of germination rate, height, wet and air dried plant weight and number of leaves were negligible, showing the relatively short residual life of the herbicide in the soil. The second series of tests was conducted under nearly the same conditions except that rape seed was added. In this case also, the residual activity of sodium chlorate disappeared in the soil about 30 days after application. Information from these and other studies shows that sodium chlorate, although moderately toxic, has relatively higher LD50 values and relatively lower chronic toxicity compared to other herbicides and that the residual activity disappears in 3-4 months at most. The use of the 50% formulation for forestry does not seem to cause any health hazard to people when the herbicide is used following the safe usage standard established by the Forestry Bureau.

73-1352. Nakae, T. (Okayama Univ., Fac. of Agr., Japan). **[Some hygienic problems on raw milk with special reference to microbiological and chemical contamination and its prevention.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 14(1): 1-17, 1973.* (128 references) (Japanese)

The quality of Japanese raw milk has been fluctuating widely with the changes in dairy farming and the chemical restrictions to reduce the contamination of raw milk by pesticides. Chemical contamination of raw milk was first manifested in 1965 and confirmed by detection of β-BHC in milk in Ueda with many subsequent problems. Residues of organomercury pesticides in milk have been prevented by the ban in 1968; organophosphorus pesticides do not persist in the rice plants used for feed. However, technical BHC which contains large amounts of β-BHC, has been applied widely and extensively on paddy fields and the rice straws fed to cows. Rice straw in Osaka Prefecture contained 3.5, 5.2, 1.9, and 12 ppm of α-, β-, γ- and total BHC. As a rule, insect pests on rice plant are more severe in western Japan so that applications and residues of BHC are greater in western milk than eastern milk. However, as the result of government programs to discontinue the use of BHC in paddy fields and the ban of DDT, contamination by organochlorine pesticide residues is decreasing slowly; for instance, from 0.255 and 0.369 ppm in 1969 (β- and total BHC in milk in Kochi prefecture) to 0.056 and 0.076 ppm in 1971 (β- and total BHC of seven prefectures) and to 0.009 and 0.017 ppm in 1972. The existing residue standards of β-BHC, total DDT, and dieldrin in Japan are 0.2, 0.05, and 0.005 ppm respectively; many milk specimens contain more.

73-1353. Davidson, J. M.; Chang, R. K. (Agron. Dept., Oklahoma State Univ., Stillwater, OK 74074). **Transport of picloram in relation to soil physical conditions and pore-water velocity.** *Soil Sci. Soc. Amer. Proc. 36(2): 257-261; 1972.* (14 references)

Miscible displacement techniques were used to study the movement of a solution containing 4-amino-3,5,6-trichloropicolinic acid (picloram) through an initially herbicide-free Norge loam soil. Picloram mobility was reduced significantly by decreasing the average pore-water velocity from 5.8 to 0.59 cm/hr. A variation in herbicide adsorption with pore-water velocity was observed at each bulk density (1.55 and 1.65 g/cm^3) and aggregate size (<2.0 and <0.42 mm) studied. For a specific bulk density, picloram adsorption was greater when the largest soil aggregate size was <0.42 mm than when the soil contained <2.0 mm aggregates. Differences in the effluent concentration distribution owing to variations in aggregate size were more evident at the lower bulk density. The average pore-water velocity influenced picloram movement more significantly than variations in bulk density or largest aggregate size at a given flow rate. (Author abstract by permission)

73-1354. Farmer, W. J.; Igue, K.; Spencer, W. F., Martin, J. P. (Soil Sci. Dept., Univ. of California, Riverside, CA). **Volatility of organochlorine insecticides from soil: I. Effect of concentration, temperature, air flow rate, and vapor pressure.** *Soil. Sci. Soc. Amer. Proc. 36(3): 443-446; 1972.* (8 references)

The volatilization of dieldrin from Gila silt loam as influenced by soil pesticide concentration was determined in the laboratory at two air flow rates at 20 and 30C. The influence of pesticide vapor pressure on volatilization was measured by comparing the volatilization from Gila silt loam of dieldrin with that of lindane and DDT. No net water movement to or from the soil occurred during any of the volatilization processes. The vapor density of the soil-applied pesticide was the main factor controlling volatilization. The rate of volatilization of dieldrin from Gila silt loam increased with increasing soil pesticide concentration until the soil dieldrin concentration reached approximately 25 μg/g. This is the soil dieldrin concentration required to give a maximum saturation vapor density equivalent to that of the pure compound. An increase in temperature of 10C increased the rate of volatilization approximately fourfold. Increasing the rate of air movement over the soil surface from 0.005 to 0.018 mile/hour increased the rate of volatilization twofold. The order of rate of volatilization of three insecticides was: lindane > dieldrin > DDT. This is the same order for increasing vapor pressures of the three insecticides. The increase in rate of volatilization of the three insecticides was less than the increase in saturation vapor density of the pure compounds. This resulted because the concentrations of lindane and dieldrin in the soil rapidly decreased below that required to give a maximum vapor density of the pesticides. The maximum volatilization rates obtained represent potential losses of lindane, dieldrin, and DDT from soils

of 202, 22, and 5 kg/ha/year, respectively. The volatilization rates decreased rapidly as soil pesticide concentration decreased. Extrapolation of the laboratory data to field situations suggests that the rate of volatilization could account for a significant proportion of these applied pesticides lost under normal field conditions. (Author abstract by permission)

73-1355. Telford, H. S. (Dept. of Entomol., Washington State Univ., Pullman, WA 99163). **Contamination of soil and water by insecticides.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 5-12.* (18 references)

More research is needed in the area of pesticide loss at the site of application since no definitive studies have been done. Insecticides can be lost from the soil through chemical and microbial degradation, volatilization, co-distillation, plant absorption, and wind and water erosion. The amount of insecticide lost during application depends on the method used but is quite large. Application of granules to the soil results in the least amount of waste. Drift by windblown DDT-laden dust particles probably contributes most substantially to DDT contamination of the environment. In soil DDT concentrations tend to accumulate to a point and then level off. Once application ceases, DDT residues drop suddenly and then level off. Accumulation of DDT in ocean organisms has been demonstrated, indicating the universal distribution of these compounds. Persistent pesticides should be recommended only when there are no other means available for insect control. Although agricultural pesticides contributed very little to the total mercury contamination now observed, seed dressings have presented a hazard and are being restricted. Lower yields and quality of agricultural crops may have to be accepted in order to achieve a low level of pollution.

73-1356. Maxwell, R. C. (Washington State Univ., Pullman, WA 99163). **Pesticide residues and tolerances.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 111-117.*

Factors related to location which affect pesticide residues on crops include climate and soil type. Rain, high temperatures, wind, or sunlight may reduce residues appreciably and soil organisms effect biochemical degradation of the pesticides. Clay and organic content of the soil affect its capacity to bind or inactivate chemicals. Groups of pesticides differ widely in their capacity to persist and formulations markedly influence the activity and persistence of pesticide residues. The type of leaf greatly determines the initial deposit on a plant, affecting the length of time a residue will be observed. These areas should be considered before a pesticide is applied. The Environmental Protection Agency governs residues on raw agricultural commodities. "No residue" and "zero tolerance" registrations have been abandoned because improved analytical techniques have found residues where none were known to exist. Registrations may be granted without a tolerance for non-food use. Commercial mixtures of pesticides must be registered separately since incompatibility or synergistic or additive effects might influence tolerances granted.

73-1357. Parmele, L. H.; Lemon, E. R.; Taylor, A. W. (Northeast Watershed Res. Cent., SWC, Agr. Res. Serv., U.S. Dept. of Agr., University Park, PA 16802). **Micrometeorological measurement of pesticide vapor flux from bare soil and corn under field conditions.** *Water Air Soil Pollut. 1(4): 433-451; 1972.* (19 references)

Micrometeorological estimates of evapotranspiration using hourly data were successfully applied in an evaluation of the movement of dieldrin and heptachlor vapor from a watershed treated with each compound at 5.6 kg/ha (disced in). Diffusivity coefficients were assumed identical for water and pesticide since they depend on the atmosphere into which each is dissipated and not on the chemical character of the compound. The pesticide flux intensity was calculated by measuring pesticide concentration profiles and considering the above assumption. At later stages of crop development the approach was modified since water vapors were released from both crop and the soil while pesticide residue vapors originated in the soil. The overall flux rate of dieldrin increased from near 0 in the morning to about 200 ng cm^{-2} s^{-1} $\times$ 10^{-6} at noon and then decreased toward zero in the evening. The data suggests that no net condensation or evaporation of pesticide occurs from the crop. Pesticide residue in the corn was about 1 to 2% of the total pesticide flux out of the soil between planting and harvest. Similar results were obtained with heptachlor. Corn leaves 30 m downwind from the treated plot accumulated 5 to 10% of the residues found on plants within the treated area.

73-1358. Smith, A. E. (Can. Dept. of Agr., Res. Sta., Box 440, Regina, Saskatchewan, Canada). **The hydrolysis of 2,4-dichlorophenoxyacetate esters to 2,4-dichlorophenoxyacetic acid in Saskatchewan soils.** *Weed Res. 12(4): 364-372; 1972.* (10 references)

The hydrolysis of the isopropyl, *n*-butyl and isooctyl esters of 2,4-dichlorophenoxyacetic acid to the free acid was studied in aqueous solutions and on three prairie soils. The esters were analyzed using electron-capture gas chromatography following extraction from solution with benzene, and from soils, using either 10% aqueous acetonitrile or a 2:1 mixture of benzene and isopropanol. Ester hydrolysis in 0.1 *N* sodium hydroxide solution was very rapid, more than 50% of all the esters being hydrolyzed in less than 1 min. In 0.1 *N* sodium carbonate solution the times for 50% hydrolysis at 20°C were $<$ 5, 5, and 30 min for the *n*-butyl, isopropyl and isooctyl esters respectively. In distilled water negligible hydrolysis occurred over a 5 hr period. The isopropyl and *n*-butyl esters underwent a very facile hydrolysis on

soils. Shaking the treated soils with 0.1 *M* calcium chloride solution for 30 min at 25°C resulted in extensive hydrolysis to the acid as determined spectrophotometrically. Under similar conditions negligible hydrolysis of the isooctyl ester occurred. After 1-5 hr at 25 ± 1°C on soils at their wilting point moisture levels, and greater, less than 15% of the applied isopropyl or *n*-butyl esters could be recovered using either extraction procedure, indicating rapid hydrolysis to the acid. After 24 hr no isopropyl or *n*-butyl ester residues could be detected in any of the soils. Loss of the isooctyl ester was slower under these conditions with approximately 20-30% of the ester remaining after 24 hr, and 10% after 48 hr. (Author abstract by permission)

73-1359. Ueyama, I.; Takase, I.; Tomizawa, C. (Nihon Tokushu Noyaku Seizo Co. Ltd., Agr. Chem. Inst., Japan). **[Fate of amiprophos (*O*-ethyl *O*-(2-nitro-*p*-tolyl)*N*-isopropyl phosphoramidothionate) in soil.]** *Zasso Kenkyu (J. Weed Soc. Jap.) 15: 28-34; 1973.* (8 references) (Japanese)

The behavior and fate of a newer organophosphorus herbicide, amiprophos (*O*-ethyl*O*-(2-nitro-*p*-tolyl)*N*-isopropyl phosphoramidothionate), were investigated in various soils using GLC with flame photometric detector and ^{32}P labeled amiprophos; the compound tends to persist and be adsorbed in soil surface layers. In an elution test on soil column nearly 90% of amiprophos was adsorbed in the top 1 cm. Persistence clearly decreased as the temperature increased. Since decomposition is delayed in sterilized soil and the residual percentage decreases as the organic matter content in soil increases, the major cause of amiprophos decomposition in soil seems to be soil-micro organisms. According to pot test results, persistence is greater in upland conditions than in flooded conditions. In metabolic experiments using ^{32}P labeled-amiprophos, amino-amiprophos, the amiprophos oxygen analog, dephenylated compounds, and a mono-ethyl compound were identified as internal metabolites. Larger amounts of amino-amiprophos were found in flooded soils than in upland soils while larger amounts of the oxygen analog were found in upland soil.

73-1360. Knoll, W.; Jayaraman, S. (Hyg. Inst., Ernst-Moritz-Arndt-Universitaet Greifswald, Griefswald, DDR). **Chlorierte Kohlenwasserstoffe in Humanmilch. [Organochlorine pesticide residues in human milk.]** *Z. Gesamte Hyg. 19(1): 43-45; 1973.* (24 references) (German)

Organochlorine pesticide residues were determined in 164 human milk samples from 96 women in 1971. All but one sample were contaminated with *p,p'*-DDT and its decomposition products such as *p,p'*-DDE. The total DDT level averaged 0.32 ppm in whole milk, with a minimum and maximum of 0.03 and 0.87 ppm, or 11.5 ppm in milk fat. In addition *o,p'*-DDT was determined in 4 women, β-BHC in 64, and PCBs in 65. The total DDT levels increased with age and were lower in overweight than in underweight or normal-weight subjects.

See also 73-1275 73-1282 73-1363 73-1367 73-1436 73-1443 73-1444 73-1445 73-1455 73-1493 73-1502 73-1509 73-1510 73-1511

73-1361. Obradovich, D. (Inst. Mother and Child Health Protect., Novi Sad, Yugoslavia). **Profilaksa akcidentalnih trovanja kod dece. [Prophylaxis of accidental poisoning in children.]** *Arh. Hig. Rada Toksikol. 22: 37-41; 1971.* (Serbocroatian)

Of the 23,086 cases of accidental poisoning among children treated in Novi Sad between 1960 and 1969, 16 were due to insecticides such as lindane, parathion, and toxaphene. Of the latter, three cases were fatal and one developed central nervous system sequelae. The need for a poison control center which would be in charge of organizing preventive measures and providing treatment is emphasized. Related consulting services should be provided by pediatric dispensaries. School and kindergarten programs should warn of the hazards involved in the use of poisonous substances. Radio, television, and newspapers should provide information to minimize poisoning accidents among children.

73-1362. Dimov, D. (Author address not given). **Lijecenje otrovanja organofosfornim pesticidima. [Treatment of organophosphate pesticide poisoning.]** *Arh. Hig. Rada Toksikol. 22: 47-50; 1971.* (4 references) (Serbocroatian)

Treatment of poisoning with organophosphates such as parathion, triamiphos, and metasystox R is reviewed. Emergency measures include establishment of an airway and artificial respiration to counteract respiratory paralysis. Atropine is administered at the rate of 2 to 4 mg every 5 to 10 min or until atropinization is maintained for 24 hr; however, prolonged use may cause ventricular fibrillation. Pralidoxime chloride should also be given to promote cholinesterase reactivation. For adults, 1 or 2 g of pralidoxime is given and the dose repeated in 1 hour. Children are given 25-50 mg per kg body weight. Morphine, aminophylline, and phenothiazines are contraindicated in organophosphate poisoning, but orciprenaline may be given if cardiac arrhythmia develops. Decontamination by gastric lavage and administration of saline cathartics prevent continued resorption of the poison. Failure of pralidoxime and obidoxime to reactivate cholinesterase in some cases was explained by prolonged release of organophosphates from "temporary storage" sites, as demonstrated by recovery of parathion from gastric fluid eight days after poison ingestion. Exchange transfusion may be required in such cases.

73-1363. Swiggart, R. C.; Whitehead, Jr, C. J.; Curley, A.; Kellogg, F. E. (Tenn. Pestic. Study, Memphis-Shelby County Health Dept., Memphis, TN 38105). **Wildlife kill resulting from the misuse of arsenic acid herbicide.** *Bull. Environ. Contam. Toxicol. 8(2): 122-128; 1972.* (13 references)

Arsenic acid, sprayed aerially for the control of Johnson grass in violation of USDA and FAA regulations, resulted in the death of 11 white-tailed deer and 8 unborn fawns in an area where state officials were trying to restore the herd. Since the 11 deer were found in a systematic search of the 600 acres sprayed and a quick survey of the surrounding woods, they probably did not represent the total mortality. Analyses of samples from five of the deer revealed an average arsenic residue of 18.96 ppm in liver, 17.78 ppm in kidney, and 22.5 ppm in rumen contents, levels sufficient to have caused death. Arsenic concentrations of 2.4 ppm in combined soil and vegetation and 0.48 and 0.36 ppm in water were found in the sprayed area. The deer loss was significant in terms of potential production. The cost for investigation and replacement was estimated as $5,071.

73-1364. Benson, W. W. (Idaho Community Study on Pesticides, Idaho). **The pesticide fire: a potential killer.** *Fire Command 40(2): 20-22; 1973.* (8 references)

Eighteen of a total force of 26 firemen were temporarily incapacitated while fighting a fire in an unmarked warehouse used for storing small amounts of malathion, diazinon, and disulfoton. The men could have undergone extensive exposure from the contaminated water in which they were wading or through inhalation of the vapors. Blood ChE was below normal in two of the more severely poisoned men for 48 hr after the fire. All personnel recovered quickly and without complications. Pesticides were found in relatively high levels after one month in the area of the fire. After 84 days more than 100 ppm disulfoton still remained. In order to avoid a far more tragic situation, all warehouses storing pesticides should bear a warning sign, and fire departments should become familiar with ways to avoid intoxication, decontamination procedures, and emergency treatment for various types of poisoning.

73-1365. Embry, T. L.; Morgan, D. P.; Roan, C. C. (Community Studies Pesticides Project, Univ. Arizona, Tucson, AZ 85721). **Search for abnormalities of heme synthesis and sympathoadrenal activity.** *J. Occup. Med. 14(12): 918-921; 1972.* (16 references)

No porphyrin was found in the urine of 45 workers daily exposed to a variety of pesticides, predominantly parathion, toxaphene, DDT, and dieldrin. The qualitative method used was capable of detecting 0.4 μg/ml. No correlations were found between serum pesticide levels and urinary excretion of ALA, PBG, and CCA. Parathion depressed plasma and/or red cell ChE in five workers. The negative findings suggest that ordinary occupational exposure to the pesticides noted above has no strong porphyrinogenic or sympathotonic effects.

73-1366. Morgan, D. P.; Roan, C. C. (Community Studies, Pestic. Program, College of Agr., Univ. Arizona, Tucson, AZ 85721). **Adrenocortical function in persons occupationally exposed to pesticides.** *J. Occup. Med. 15(1): 26-28; 1973.* (25 references)

No systematic differences in steroid excretion or serum cortisol were observed between a group of men exposed to pesticides regularly for at least six years and firemen who had only occasional contact with household pesticides. Subjects whose serum levels of DDT, DDE, or dieldrin were 5 to 10 times or higher than those found in low storage subjects had no differences in steroid excretion or serum cortisol. No effects were observed with serum levels of *o,p'*-DDT over a range of 0 to 15 ppb. However, with serum levels of $>$ 2 ppb β-BHC a significant increase in urinary excretion of ketosteroids was observed. Subjects demonstrably exposed to organophosphates had a mean serum cortisol level of 16.0 μg%, not significantly different from the mean for non-exposed individuals. In this group steroid measurements were not made. None of the serum samples contained *o,p'*-DDD (TDE), and it appears from the results that the devastating effects on adrenal tissue and on steroid metabolism which result from large doses of *o,p'*-DDD are not a significant risk in workers exposed to DDT and a wide range of other pesticides.

73-1367. Iskandarov, T. I. (Uzbek Sci. Res. Inst. Sanit., Hyg., Occup. Diseases, USSR). **Gigiyena primeneniya pestitsidov v Uzbekistane. [Hygienic problems of the application of pesticides in Uzbekistan.]** *Med. Zh. Uzb. 5: 17-19; 1972.* (Russian)

General hygienic and toxicological problems involved in handling and application of pesticides in Uzbekistan, the cotton belt of the USSR, are described. Maximum allowable pesticide concentrations in the air have been determined: 10 mg/m^3 for potassium chlorate-chloride and magnesium chlorate; 1 mg/m^3 for milbex and calcium cyanamide; 0.5 mg/m^3 for TMTD (thiram), dimethoate, anthio (formothion), and cyanamide; 0.1 mg/m^3 for DDT, hexachlorane (BHC), metaphos (methyl parathion), methylmercaptophos, intrathion (thiometon), sodium fluorosilicate and kilval (vamidothion); 0.05 mg/m^3 for gamma-BHC (lindane) and thiophos (parathion); and 0.02 mg/m^3 for schradan. The sanitary protection zone for aircraft and tractor application of organophosphorus pesticides should be 1,000-500 m and 500 m, and other less toxic pesticides require a clearance of 300 m. Pesticide can be determined within a radius of 1,500 m following aircraft application. The pesticide residue contents on fruits and vegetables following pesticide application from aircraft may exceed the maximum allowable values. Specific antibodies to butyphos (DEF), methylmercaptophos, DDT, and BHC were detected in blood samples from several cotton growers. Mercaptophos (demeton), aldrin, endothall, methylmercaptophos, and DDT, now banned in the agriculture of Uzbekistan, have been replaced by such preparations as anthio, phosphamide (dimethoate), and milbex.

73-1368. Siriez, H. (Author address not given). **Les centres anti-poisons. [Poison control centers.]** *Phytoma 25(242): 19-24; 1973.* (French)

An interview with the director of the Paris City Poison Information Center is reproduced. Eleven other poison information centers are located in Angers, Clermont-Ferrand, Lille, Lyon, Marseille, Montpellier, Nancy, Rennes, Strasbourg, Toulouse, and Tours, France. A round-the-clock telephone answering service is manned by graduate physicians and interns, and an epidemiological evaluation of poisoning incidents is conducted on a regular basis. Around one tenth of all poisonings is due to the ingestion of household chemicals, pesticides, and mushrooms. The absolute number of poisonings has been declining for the past years, partly because of the activity of the poison information centers. Poisonings with pesticides are mostly from organophosphorus compounds which increasingly replace organochlorine pesticides of relatively low acute toxicity. While certain organophosphorus pesticides, such as parathion, are highly toxic, others (malathion and bromophos) have lower acute toxicity than some organochlorine compounds and are practically harmless.

73-1369. Dmochowska-Mroczek, H.; Lebensztejn, W.; Tolwinski, K. (Dept. Intern. Med. and Dept. Neurol., Regional Hospital "Sniadecki," Bialystok, Poland). **Ciezkie zatrucie Dipteksem u ciezarnej. [Severe intoxication with Dipterex in a pregnant woman.]** *Pol. Tyg. Lek. 27(36): 1406-1407; 1972.* (6 references) (Polish)

Ingestion of approximately 15 g of Dipterex (trichlorfon) by a 17 year old pregnant girl resulted in severe poisoning and coma. Intubation using succinylcholine was used to relieve respiratory disturbances. The patient did not resume independent respiration and a respirator had to be used for six hours. The patient regained consciousness 10 hours after poisoning. Treatment included atropine (amount not specified) and toxogonin (obidoxime) (1000 mg). Several weeks after discharge neurologic complications involving the lower extremities were noted. These included paresthesia, weakness, loss of innervation, and decrease in speed of transmission. Trophic changes and paresthesia disappeared after two months. It is concluded that Dipterex intoxication may lead to neurologic complications. In cases of intoxication of uncertain origin, succinylcholine should be used cautiously since inhibition of cholinesterase prolongs the activity of succinylcholine and intensifies respiratory disturbances.

73-1370. Bomirska, T.; Winiarska, A. (Dept. Intern. Med., Municipal Hospital, Gdynia, Poland.) **Toksykologia karbaminianow na pryzykladzie zatrucia preparatem Baygon z grupy insectycydow. [Toxicology of carbamates as exemplified by intoxication with Baygon insecticide.]** *Pol. Tyg. Lek. 27(37): 1448-1450; 1972.* (10 references) (Polish)

Two cases (one fatal) of poisoning with Baygon

(propoxur) ingested in suicide attempts are described in detail. In the first case a 36 year old man ingested 200 ml of the insecticide. The patient died five days later without regaining consciousness in spite of intensive treatment including gastric lavage, forced diuresis, drainage of respiratory tract, antibiotics, atropine, and PAM: 10 mg atropine and 0.5 g of PAM intravenously on the first day; 55 mg atropine and 0.5 g PAM on the second; 22 mg atropine and 4 x 0.25 g toxogonin (obidoxime) the third; and 30 mg atropine and 2 x 0.025 g toxogonin the fourth day. In the second case a 32 year old man ingested 150 ml of the insecticide. His condition was not as severe as that of the first patient. Cholinesterase activity was within normal limits (61, 66.5, 65.7 units). The patient responded quickly to treatment with relatively small doses of atropine: 6 mg intravenously during the first three days, 4 mg on the fourth day, and decreasing amounts on the following six days. The normal levels of cholinesterase suggest spontaneous reactivation of this enzyme. The resemblance between carbamate and phosphoorganic compound poisoning is briefly discussed.

73-1371. Ludosan, E. (Author address not given). **Metoda de denocivizare a echipamentului de protectie utilizat la combaterea daunatorilor din agricultura. [A method for the decontamination of the protective equipment used in pest control.]** *Rev. Chim. (Bucharest) 23(5): 308-310; 1972.* (9 references) (Rumanian)

Chemical procedures for the decontamination of protective equipment after exposure to organophosphates such as malathion or parathion are presented. Malathion can be removed by washing with water at room temperature or 45°C and soaking in 0.2 to 0.5% sodium hydroxide solutions at room temperature for 24 hours. Rinsing with water (twice) provides satisfactory results with malathion residues below 2 γ/cm^2, regardless of the handled malathion concentration. Parathion preparations containing 50% active matter can be removed by washing the equipment with a 2% sodium hydroxide and a 0.5% sodium or potassium bichromate solution after a first wash with water at 50°C; the equipment is then boiled 1/2 hour with the sodium hydroxide and bichromate solution mixture and rinsed twice with clean water; parathion residues are reduced to below 5 γ/cm^2. Protective equipment can be decontaminated by 1/2 hr soaking in a 0.5% sodium bisulfite solution at room temperature after exposure to diluted (0.08-0.10%) parathion preparations. Rinsing with water provided decontamination of residues as low as 2 γ/cm^2 parathion.

73-1372. Bailey, J. B.; Swift, J. E. (Univ. of California Davis, CA). **Health hazards of pesticides and related problems.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 17-72.* (25 references)

The health hazards from a particular pesticide can be estimated from the human and animal toxicity, included in tabular form, and other variables such as formulation, type of equipment used for application, and frequency of application. Generally, wettable powders, dusts, and granular pesticides are less readily absorbed through the skin than liquid formulations. Inhalation of vapors and dusts and ingestion of any material are other routes of entry into the body. Once a compound has entered the body it approaches a steady state of storage, provided it is tolerated by the organism; its water solubility and the ability of the organism to metabolize it influence the elimination rate. Symptoms and first aid for each type of poisoning, as described, should be common knowledge to all who work with pesticides. Following label instructions, keeping records of pesticide use, and employing protective clothing and devices can reduce health hazards. Respiratory devices are described in detail. Gas masks and cartridge respirators are generally used. Humidity, temperature, and volume of breathing affect the life of chemical-absorbing cartridges. Gas masks must be worn when formulating pesticides in inadequately ventilated spaces or for application of highly toxic materials.

73-1373. Anderson, A. B. (Washington State Dept. Social and Health Serv., Olympia, WA). **Disposal of waste pesticides and containers.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 73-78.* (16 references)

Pesticide waste ranges from spillage and debris left over from a fire to empty containers. The containers are potentially one of the major sources of pesticide poisoning and a locked well-ventilated area should be set aside for storage of all containers until they can be detoxified and recycled or compacted for landfill. Since pesticides should only be handled by specialists, mass recycling efforts by environmental activists should be avoided. Proper planning of purchase and application of pesticides can reduce waste and prevent the necessity for storing such chemicals. Construction of a concrete pad equipped with drain and sump and an open drainfield under gravel with no outlet is recommended for cleaning equipment. Particular sanitary landfill sites have been chosen by local health departments as suitable for pesticide containers and a certain level of management is required at these sites. Rinsing containers twice and emptying the rinse into the spray tank removes about 98% of the remaining toxicant. Burning large amounts of paper containers and any container used for weed killers of the 2,4-D type is not recommended. Transfer of pesticides to nonstandard containers is generally prohibited. Incineration is acceptable if adequate incinerators are available. The homeowner may dispose of small amounts of pesticide in an 18 inch hole, using sawdust as diluent and covering with soil, provided children do not play in the area. The local health department should be contacted for other procedures.

73-1374. Anderson, A. B. (Washington State Dept. Social and Health Serv., Olympia, WA). **Transportation of pesticides and other hazardous materials.** *IN: Washington Pest Control Handbook, Washington State University, Pullman, 1971, pp. 79-90.*

The Code of Federal Regulations, Title 49–Transportation, is the principal document on all aspects of transportation of pesticides and other hazardous materials. The materials are classified as poisons (3 groups), flammable liquids, flammable solids, oxidizing materials, corrosive liquids, and compressed gases. Each must be packaged in a designated container. Placarding is standardized for truck carriers, and pesticide manufacturers are responsible for attaching certain labels on the products. Poisonous materials must not be transported with anything intended for human or animal consumption. A number of other safe practices must be followed by shippers and incidents involving hazardous materials must be reported to the Department of Transportation.

73-1375. Thiele, E.; Huyoff, H.; Selchow, B. (Lehrstuhl f. Arbeitshygiene, Ernst-Moritz-Arndt-Universitaet Greifswald, Greifswald, DDR). **Laengsschnittstudie zum Einfluss der Pflanzenschutzmittel-und Klimaexposition auf die Lungenfunktion bei Agrochemikern und Agrotechnikern. [Longitudinal study on the effects of pesticides and exposure to weather on pulmonary function in pesticide applicators and agricultural technicians.]** *Z. Gesamte Hyg. 19(1): 65-66; 1973.* (German)

Forced expiratory volume and vital capacity were investigated in thirty 22-39 year olds exposed to pesticides, twenty 23-44 year olds exposed to weather, and thirty 22-41 year old control subjects. Three examinations were conducted within an 18 month period, the first and third during November-February and the second during May-July immediately after climatic and/or pesticide exposure. Forced expiratory volume was significantly lower in the pesticide exposed group in the summer in comparison with the other groups and with winter examinations. Forced expiratory volume was reduced during the winter in the weather exposed group. The vital capacity was insigificantly reduced after exposure to pesticides. Exposure to pesticides and/or humid, cold weather seems to provoke at least temporary obstructive ventilatory difficulties. The degree of the dysfunction correlates with exposure time or years of service.

73-1376. Aleksandrovskiy, V. N. (Poisoning Treatment Center, Sklifosovskiy Sci. Res. Inst. First Aid, Moscow, USSR). **Differentsial'naya diagnostika nekotorykh tyazhelykh otravleniy s ispol'zovaniyem elektroentsefalograficheskikh dannykh. [The differential diagnosis of some severe intoxications by the use of EEG data.]** *Zh. Nevropatol. Psikhiatr. im. S. S. Korsakova 70: 1162-1167; 1970.* (14 references) (Russian)

Clinical and electroencephalographic studies of 69 cases of severe coma due to poisoning with barbiturates, organophosphorus compounds such as chlorophos (trichlorfon) and thiophos (parathion) are reviewed. Serious cases of poisoning with organophosphorus compounds were characterized by deep coma, miosis, absence of response to light, partial or total absence of corneal reflexes, paralysis of motor, pharyngeal, and respiratory muscles, bronchorrhea, possible central paralysis of respiratory organs, and pronounced hypotension. Electroencephalographic examinations revealed the presence of rhythms of 20-26 c/s frequency and slow waves in the low-amplitude theta rhythm. No change in the background activity due to light stimulation or the introduction of 20 ml of Bemegride was observed.

See also **73-1291** **73-1316** **73-1417** **73-1464** **73-1465**

73-1377. Langkramer, O. (Lab. biol. Pudy, Vyzkumny ustav lesniho hospodarstvi a myslivosti, Zbraslav n/Vlt.-Strnady, Czechoslovakia). **Laboratorni metoda stanoveni ucinku pesticidu na pudni mikroorganismy v cistych kulturach. [Laboratory method for the determination of pesticide effects on soil microorganisms in pure cultures.]** *Agrochemia (Prague) 12(7): 193-199; 1972.* (19 references) (Czech)

The inhibitory effects of seven herbicides and eight fungicides on cultures of sporulating bacteria including *Azotobacter chroococcum, B. cereus v. mycoides, B. subtilis, B. megatherium,* and *B. polymyxa* were determined by measuring areas of the inhibition zones issuing from the interaction between pesticide and microorganism. Some fungicides also inhibited the growth of bacilli; of the herbicides only PCP inhibited the growth of micromycetes. The bacilli tested manifested varying degrees of sensitivity to individual pesticides and fungicides. PCP and Nematin (metham) were the strongest inhibitors of soil microorganisms; Gramoxone (paraquat) also inhibited the growth of microorganisms in vitro. Azotobacter lost its pigment forming ability at some distances from the inhibition source. Results of laboratory tests in vitro often corresponded with the action of pesticides on the micro and mycoflora in the soil of forest nurseries.

73-1378. Eydel'nant, N. M.; Mostovaya, V. I. (Central Asia Inst. Phytopathol., Tashkent, USSR). **K voprosu o metabolizme 2,4-D v rasteniyakh. [Metabolism of 2,4-D in plants.]** *Agrokhimiya 11: 121-124; 1972.* (12 references) (Russian)

Distribution and metabolism of ^{14}C-labeled 2,4-D were studied in wheat, barley, bean, cotton, and lilac. No 2,4-D was detected in grains of wheat and barley. However, 2,4-D was found in grains of cotton and bean plants treated during and after flowering. Both intact 2,4-D and its biologically inactive metabolites were detected in such grains. Differences in the anomalies observed in germs from 2,4-D-treated plants and from 2,4-D-soaked seeds were established. Water-soluble extracts from 2,4-D-treated beans and lilacs, when transferred onto leaves of intact beans and lilacs, readily penetrated into the tissues of these plants and produced regenerated 2,4-D and its hydroxylated derivatives.

73-1379. Ortwein, L. (Inst. Plant Protection, Poznan, Poland). **Ueber den DDT-Metabolismus beim Feldhasen (*Lepus europaeus* Pall.) und seine Rolle beim Vergiftungsprozess. [Studies on DDT metabolism of the hare (*Lepus europaeus* Pall.) and its role in the poisoning process.]** *Anz. Schaedlingsk. Pflanzensch. 45(12): 182-186; 1972.* (5 references) (German)

The yearly cycle of the DDT metabolism in hare (*Lepus europaeus* Pall.) was studied. The residue determinations were performed by gas chromatography. An annual rhythm of the metabolic process corresponding to physiological processes was determined. The intense transformation of a major part of the DDT absorbed into mobile *p,p'*-DDD (TDE) and *p,p'*-DDE, which are excreted with urine 5 to 10 days after uptake, decreases the poisoning hazard considerably. The DDT metabolism considerably intensifies in the fall and winter periods with increased weight loss. The proportion of DDT metabolites within the total DDT content in renal fatty tissue samples of hare killed in winter ranged from 80 to 83%. The corresponding percentages for hare killed in March-April, June, August, November, and December were 85%, 44%, 29%, 71% and 75%, respectively.

73-1380. Wilson, B. W.; Stinnett, H. O.; Fry, D. M.; Nieberg, P. S. (Dept. of Avian Sci., Univ. of California, Davis, CA 95616). **Growth and metabolism of chick embryo muscle cultures. Inhibition with malathion and other organophosphorus compounds.** *Arch. Environ. Health 26(2): 93-99; 1973.* (38 references)

Malathion and malaoxon inhibited growth (cell number, protein, DNA) of chick embryo pectoral muscle cultures. Low-protein phosphate-buffered medium with pesticide was more toxic than high-protein, carbon dioxide-buffered medium. Growth was also inhibited by parathion and paraoxon. Malathion, but not malaoxon, inhibited the respiration of cells, tissue homogenates, and mitochondrial fractions. Oxygen consumption of intact cells was inhibited by malathion under conditions in which it was toxic to growth. The results suggested oxidation of α-ketoglutarate as one site of malathion action. Acetylcholinesterase (AChE) activity was studied by spectrophotometry, cytochemistry, and gel electrophoresis. Muscle cultures and embryo muscle tissue had similar AChE isozymes. Cells grown with malaoxon had less AChE activity than those grown with malathion. Levels of AChE activity did not correlate with toxicity of the organophosphorus agents. (Author abstract by permission)

73-1381. Azarnoff, D. L.; Svoboda, D. J. (Clin. Pharmacol. Toxicol. Cent., Dept. of Med. and Pharmacol. and Pathol., Univ. of Kansas Med. Cent., Kansas City, KS). **Microbodies in experimentally altered cells. VI. Thyroxine displacement from plasma proteins and clofibrate effect.** *Arch. Int. Pharmacodyn. 181(2): 386-393; 1969.* (35 references)

The proliferation of microbodies in clofibrate-fed animals is not abolished by thyroidectomy nor, except for acetylsalicylic acid, seen after other drugs which displace thyroxine from its plasma protein binding sites. A hypocholesterolemic effect is not demonstrated after administration of novobiocin, acetylsalicylic acid, trypan blue, or 2,4-dichlorophenoxy acetic acid, drugs which displace thyroxine from plasma proteins. These observations make less tenable the hypothesis that thyroid hormone displacement is the mechanism of action of clofibrate. (Author abstract by permission)

73-1382. Wade, A. E.; Caster, W. O.; Greene, F. E.; Meadows, J. S. (Dept. of Pharmacol. and Nutrition, Univ. of Georgia, Athens, GA). **Effect of thiamine and dietary linoleate levels on hepatic drug metabolism in the male rat.** *Arch. Int. Pharmacodyn. 181(2): 466-473; 1969.* (10 references)

In vitro hexobarbital metabolism was uniformly depressed about 40% in rats fed diets deficient in fat when compared to rats receiving the same diets supplemented with 3% by weight of corn oil. The rate of hexobarbital metabolism did not appear to be affected by the amount of thiamine consumed. The metabolism of aniline and heptachlor was reduced by thiamine in the diet with half-maximal depression occurring at about 1.0 μg thiamine per day in both those receiving 3% corn oil in their diets and in those receiving the fat-free diets. Although aniline and hexobarbital metabolism was depressed in nearly all groups fed the fat-free diets, heptachlor metabolism was depressed only in those groups receiving in excess of 15 μg thiamine per day. (Author abstract by permission)

73-1383. Sud, R. K.; Sud, A. K.; Gupta, K. G. (Dept. Microbiol., Panjab Univ., Chandigarh, India). **Degradation of Sevin (1-naphthyl-*N*-methyl carbamate) by *Achromobacter* sp.** *Arch. Mikrobiol. 87(4): 353-358; 1972.* (34 references)

A strain of *Achromobacter* capable of using Sevin (carbaryl) as the sole source of carbon was isolated using an enrichment technique. Chromatographic analysis of extracts of the medium revealed the presence of 1-naphthol, hydroquinone, catechol, and pyruvate. Esterase activity was probably responsible for the formation of 1-naphthol. The catechol may have resulted from 1-naphthol degradation. The organism grew on 1-naphthol, hydroquinone, catechol, and pyruvate without any lag phase, suggesting that these are intermediates in the degradation of carbaryl by *Achromobacter*.

73-1384. Alsen, C.; Ohnesorge, F. K. (Inst. Pharmakologie, Abteilung Toxikol., Christian-Albrechts-Univ., Kiel, Germany). **Characterization of cholinesterases in various tissues of guinea pig with respect to their reactivation by obidoxime after inactivation by diisopropylfluorophosphate.** *Arch. Toxicol. 29(3): 235-245; 1972.* (26 references)

Specific and non-specific ChEs of guinea pig erythrocytes, plasma, brain, and cardiac ventricular muscle were inhibited to different extents by obidoxime and inactivated at different rates by DFP. Obidoxime at 10^{-4} and $10^{-3}M$ inhibited the specific ChE of erythrocytes nearly twice as much as that of brain tissue and inhibited non-specific brain and ventricular muscle ChE to a greater extent than that of plasma. The DFP inactivation constants were about 2.5 times larger for non-specific brain ChE than for plasma and ventricular muscle ChE during the first 30 min of the reaction. Different aging rates were exhibited by the ChEs inactivated by DFP as estimated from decreased reactivation by obidoxime after prolonged phosphorylation. The values obtained for the half-life constants of the "aging" process at $10^{-3}M$ obidoxime were: ventricular muscle 150 min; brain 164 min; and plasma 49 min.

73-1385. Bajgar, J.; Urban, R.; Hrdina, V. (Med.Forschungsinstitut J. E. Purkyne, Hradec Kralove, Czechoslovakia). **Hemmung der Acetylcholinesterase in 27 Abschnitten des Hundegehirns durch *O*-Aethyl-*S*-(2-dimethylaminoaethyl)-methylphosphonothioat in vivo. [In vivo inhibition of acetylcholinesterase in 27 areas of the dog brain by *O*-ethyl-*S*-(2-dimethylaminoethyl) methylphosphonothioate.]** *Arch. Toxikol. 29(3): 247-253; 1972.* (23 references)

Acetylcholinesterase activity in 27 areas of the dog brain was studied after i.v. infusion of *O*-ethyl-*S*-(2-dimethyl-aminoethyl) methylphosphonothioate, administered 20.0 μg/kg per 10 min. This activity was significantly decreased in all brain parts studied; the greatest decrease was observed in the nucleus nervi vagi, hypoglossi, and in the colliculus superior. (Author abstract by permission)

73-1386. Okonek, S. (Inst. fuer Pharmakol. und Toxikol. der Univ. Goettingen, Germany). **Gaschromatographische Untersuchungen uber die direkte Umsetzung von Soman und Paraoxon mit Pyridinium-Aldoximen in vitro. [Gaschromatographic analysis of direct interaction of soman and paraoxon with pyridinium aldoximes in vitro.]** *Arch. Toxikol. 29(3): 255-264; 1972.* (26 references)

The direct interaction of soman and paraoxon with pyridinium aldoximes was studied in vitro. The kinetics of reaction were measured gaschromatographically from decrease of soman concentration and rise of *p*-nitrophenol, a reaction product of paraoxon. Using oxime concentrations of $5 \times 10^{-4}M$ (HS-3, Obidoxime) and $10^{-3}M$ (HS-6, 4-PAM) respectively, half time of soman is in the range of 14 to 19 min at pH 7.4 and 37°C. To obtain similar half times for the reaction between paraoxon and oximes the concentration of oximes has to be increased two powers of ten. The question whether this direct interaction can be used as an antidote principle in therapy of soman or paraoxon intoxication is discussed. (Author abstract by permission)

73-1387. Walker, A. I. T.; Blair, D.; Stevenson, D. E.; Chambers, P. L. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **An inhalational toxicity study with dichlorvos.** *Arch. Toxikol. 30(1): 1-7; 1972.* (8 references)

Dogs, cats and rabbits were continuously exposed for eight weeks to dichlorvos atmospheres generated

from impregnated polyvinyl chloride strips. Concentrations of dichlorvos in air were produced in the range 0.05 to 0.3 μg/l. No effects were found on the general health, behavior, plasma and erythrocyte cholinesterase activities, and electroencephalographic patterns of the animals. (Author abstract by permission)

73-1388. Hutson, D. H.; Hoadley, E. C. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The comparative metabolism of [^{14}C-vinyl] dichlorvos in animals and man.** *Arch. Toxikol. 30(1): 9-18; 1972.* (12 references)

The routes of excretion and retention of radioactivity following the ingestion of [1-^{14}C-vinyl] dichlorvos by mice and hamsters have been determined. The excretion of radioactivity in urine and exhaled air of man has also been measured. The data have been compared with those for rats. The results indicate that metabolism is rapid in the four species. Dealkylation to desmethyldichlorvos is a minor route of biotransformation, except in the mouse, where desmethyldichlorvos constitutes at least 18.5% of the administered radioactivity. Hydrolytic metabolism of dichlorvos occurs in all species and leads presumably to dichloroacetaldehyde which is further metabolized by reduction to dichlorethanol and excretion in the urine as the glucuronide and dechlorination followed by incorporation of the carbon atoms into endogenous biosyntheses and excretion as [^{14}C]carbon dioxide and [^{14}C]hippuric acid in the urine. Dichloroethanol can be detected in β-glucuronidase-treated urine after exposure of a human subject to high air concentrations (38 μg/l.) of non-radioactive dichlorvos. This may form the basis of a method of monitoring the exposure of humans to high concentrations of dichlorvos. (Author abstract by permission)

73-1389. Page, A. C.; Loeffler, J. E.; Hendrickson, H. R.; Huston, C. K.; De Vries, D. M. (Biol. Sci. Res. Cent., Shell Development Co., Modesto, CA). **Metabolic fate of dichlorvos in swine.** *Arch. Toxikol. 30(1): 19-27; 1972.* (24 references)

The metabolic fate of dichlorvos in swine has been studied by short- and long-term oral and inhalation exposure studies utilizing ^{32}P-, ^{36}Cl-, or ^{14}C-labeled dichlorvos. In dietary studies slow release formulations in PVC were used. No intact dichlorvos could be determined in the blood or tissues of treated animsls, and, of the recognized metabolites, only dichloroethanol was found in measurable quantities under some conditions. Studies with ^{36}Cl-dichlorvos demonstrated that no organochlorine metabolic residues accumulated in tissues. The cumulative evidence from all studies indicates that the detoxification and degradation of dichlorvos in swine proceeds by essentially the same route whether the compound is administered orally or by inhalation exposure. This degradation proceeds almost exclusively via cleavage of the vinyl-phosphate bond and subsequent dechlorination of the dichlorovinyl product. Evidence is presented for the presence of a symmetrical two-carbon intermediate prior to the formation of glycine, an early metabolic product utilizing the vinyl carbons of the dichlorvos molecule. The isolation and identification of numerous ^{14}C-labeled normal biochemical cell constituents implies that further degradation proceeds via well-recognized metabolic pathways. (Author abstract by permission)

73-1390. Thorpe, E.; Wilson, A. B.; Dix, K. M.; Blair, D. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Teratological studies with dichlorvos vapour in rabbits and rats.** *Arch. Toxikol. 30(1): 29-38; 1972.* (14 references)

The teratogenic potential of inhaled dichlorvos vapor for rabbits and rats was investigated on the offspring of primiparous female Dutch rabbits weighing 2 to 3 kg and primiparous female Carworth E strain rats weight 200 to 300 g. The animals were exposed throughout pregnancy at concentrations of 0.25, 1.25, and 6.25 μg dichlorvos per liter of air. In an additional experiment pregnant rabbits were exposed to concentrations of 2 and 4 μg dichlorvos per liter of air. The results gave no indication that dichlorvos vapor is teratogenic in rabbits or rats even at exposure concentrations resulting in maternal deaths in rabbits, and causing depression of plasma, erythrocyte, and brain cholinesterase activities in pregnant animals of both species. (Author abstract by permission)

73-1391. Dean, B. J.; Thorpe, E. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Cytogenetic studies with dichlorvos in mice and Chinese hamsters.** *Arch. Toxikol. 30(1): 39-49; 1972.* (16 references)

Mice were exposed to atmospheres containing vapor concentrations of 64 to 72 μg dichlorvos per liter for 16 hr, or to 5 μg per liter for 21 days. Chinese hamsters were exposed by the inhalation and oral routes to high concentrations of dichlorvos. In chromosome preparations made from bone marrow and spermatocytes following exposure, the incidence of chromosome abnormalities did not differ from the control value. Endoxan, used as a positive control substance, caused chromatid aberrations in bone marrow from both species, but the incidence of meiotic chromosome abnormalities did not differ from the untreated control value. (Author abstract by permission)

73-1392. Dean, B. J.; Thorpe, E. (Shell Res. Ltd.,Tunstall Lab., Sittingbourne, Kent, England). **Studies with dichlorvos vapour in dominant lethal mutation tests on mice.** *Arch. Toxikol. 30(1): 51-59; 1972.* (14 references)

Male CF1 mice were exposed to atmospheres containing dichlorvos at concentrations of 30 and 55 μg per

liter of air for 16 hr, or to 2.1 and 5. 8 μg per liter for 23 hr daily for four weeks. These exposures to dichlorvos produced no mutagenic effects as expressed by increased pre-implantation losses or early fetal deaths in subsequent test matings. No impairment of male fertility was detected following the exposures to dichlorvos vapor. (Author abstract by permission)

73-1393. Dean, B. J.; Doak, S. M. A.; Funnell, J. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Genetic studies with dichlorvos in the host-mediated assay and in liquid medium using *Saccharomyces cerevisiae*.** *Arch. Toxikol. 30(1): 61-66; 1972.* (16 references)

Host-mediated assays, using *Saccharomyces cerevisiae* D 4 as the test organisms, were carried out on male mice dosed orally with dichlorvos or ethyl methanesulphonate, or exposed to dichlorvos vapor. After 5 hr, harvested yeast cells were analyzed for mitotic gene conversion at the ade_2 (adenine) and trp_5 (tryptophan) loci. No enhancement of mitotic gene conversion was recorded in yeast cells harvested from mice which had been dosed orally with 50 or 100 mg dichlorvos per kg, or exposed for 5 hr to atmospheres containing 60 or 99 μg dichlorvos vapor per liter. In mice dosed orally with 400 mg/kg ethyl methanesulphonate the rate of mitotic gene conversion was increased at both loci. In stationary phase cultures of the yeast treated with dichlorvos or ethyl methanesulphonate the mitotic gene conversion rate was determined after 5 hr. Dichlorvos increased the rate of conversion at both loci at a concentration of 4 mg/ml, but no effect was evident with 2 mg/ml dichlorvos. One mg/ml ethyl methanesulphonate was positive at both loci. These experiments show that high concentrations of dichlorvos in the culture medium can increase the mitotic gene conversion rate in *Saccharomyces cerevisiae* in vitro but the host-mediated assay yields negative results associated with the rapid metabolism of the compound when given by the oral or inhalation routes. (Author abstract by permission)

73-1394. Dean, B. J. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The mutagenic effects of organophosphorus pesticides on micro-organisms.** *Arch. Toxikol. 30(1): 67-74; 1972.* (21 references)

Nine organophosphorus pesticides and twelve known chemical mutagens were applied to agar plate cultures of *Escherichia coli* WP 2. After incubation, the cultures were examined for an increase in reverse mutation rate. Dicrotophos and dichlorvos, and four alkylating agents were tested against two mutant strains of Serratia marcescens using the paper disc technique. The organophosphorus pesticides did not increase the reversion rate in *Escherichia coli* WP 2. Dicrotophos was also negative when tested against Serratia marcescens. Dichlorvos induced a dose-related increase in reversion rate in both strains of Serratia marcescens. The significance of the results are discussed in relation to the rapid metabolism of dichlorvos in vivo and the absence of any mutagenic effect in mammalian test systems. (Author abstract by permission)

73-1395. Dean, B. J. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The effect of dichlorvos on cultured human lymphocytes.** *Arch. Toxikol. 30(1): 75-85; 1972.* (12 references)

Dichlorvos (2,2-dichlorvinyl dimethyl phosphate) was added at specific intervals to cultures of human lymphocytes at concentrations ranging from 1 to 40 μg/ml. Subsequent examination showed that dichlorvos was cytotoxic to cells at concentrations of 5 to 40 μg/ml and that cytotoxicity was not accompanied by significant cytogenetic changes. (Author abstract by permission)

73-1396. Vitorovic, S.; Kapor, S.; Neskovic, N.; Zezelj, A. (Pesticide Factory, Beograd-Zemun, Yugoslavia). **Sadrzaj parationa u tkivima akutno otrovanih pacova. [Parathion content of acute poisoned rat tissues.]** *Arh.. Hig. Rada Toksikol. 22(2): 151-154; 1971.* (8 references) (Serbocroatian)

Organ distribution of parathion in male rats was studied after a single i.p. injection of 20 mg/kg of a 98.8% product dissolved in 1.0 ml of propylene glycol. Brain, liver, and abdominal muscle tissues were analyzed from rats sacrificed 60, 120, 180, and 240 min post-injection. No parathion could be detected at any time in brain samples under the experimental conditions (extraction with acetonitrile, purification by TLC, analysis by GLC with a phosphorus detector). The trace amounts of parathion occurring in liver and muscular tissues 60 min after parathion administration were not measurable. Liver tissue had a maximum of 0.971 μg/g parathion 120 min post-injection, and 0.125 and 0.205 at 180 and 240 min. Parathion levels in muscular tissue reached a maximum of 7.158 μg/g 180 min post-administration, and decreased to 0.536 μg/g at the last determination. In vitro experiments indicated 65.74, 74.15, and 76.90% parathion recovery in brain, muscle, and liver tissues, respectively.

73-1397. Davies, D. R.; Holland, P. (Chem. Defense Estab., Porton Down, Salisbury, Wilts., England). **Effects of oximes and atropine upon the development of delayed neurotoxic signs in chickens following poisoning by DFP and sarin.** *Biochem. Pharmacol. 21(23): 3145-3151; 1972.* (10 references)

The oximes, 2-hydroxyiminomethyl-*N*-methylpyridinium methyl methanesulphonate (P2S) and the dodecyl iodide salt (PAD) and atropine sulphate have been shown to be without effect upon the development of delayed neurotoxic signs in chickens after poisoning by diisopropyl phosphorofluoridate (DFP). The produc-

tion of delayed neurotoxic signs by repeated sub-neurotoxic doses of DFP and isopropyl methylphosphonofluoridate (sarin) and the effect of varying the time interval between these doses have been demonstrated in chickens. Sub-neurotoxic doses of DFP and Sarin appear to be additive in their action and the interval between successive intoxications may be quite long-16 days with DFP. (Author abstract by permission)

73-1398. Patocka, J. (Purkyne Med. Res. Inst., Hradec Kralove, Czechoslovakia). **Reactivation of isopropylmethylphosphonylated acetylcholinesterase by α,ω-bis-(4-hydroxyiminomethylpyridinium)-2-*trans*-butene dibromide. The effect of temperature.** *Biochem. Pharmacol. 21(23): 3192-3196; 1972.* (10 references)

Acetylcholinesterase prepared from bovine erythrocytes was inhibited by incubation for 30 min at 25° with isopropylmethylphosphonofluoridate (sarin). The reactivation was performed with α,ω-bis-(4-hydroxyiminomethylpyridinium)2-*trans*-butene dibromide at a concentration of 0.01 to 0.1 m*M* and pH 8.0 in a sodium phosphate buffer, over a temperature range between 5 and 40°C. Bimolecular reaction rate constants, free energies, and entropies of reactivation were determined at the temperatures investigated. The activation energy was calculated as kcal/mole, based on the temperature dependence of the reaction rates, and is similar to values reported in the literature for diisonitrosoacetone, pralidoxime methiodide, and isonitrosoacetophenone.

73-1399. Greig, J. B. (MRC Toxicol. Unit, Med. Res. Council Lab., Carshalton, Surrey, England). **Effect of 2,3,7,-tetrachlorodibenzo-1,4-dioxin on drug metabolism in the rat.** *Biochem. Pharmacol. 21(23): 3196-3198; 1972.* (15 references)

Male albino Porton rats, 7-8 wk old, were orally administered a single dose of dioxin at 200 g/kg. The duration of paralysis induced by zoxazolamine hydrochloride measured one or three days later was reduced by 54% compared to controls receiving the peanut oil vehicle alone. The sleeping time after intraperitoneal injection of hexobarbitone sodium was significantly prolonged after one day and more than doubled three days after a single oral dose of dioxin in dimethyl sulfoxide in male or female rats. To eliminate the possibility that the depression of hexobarbitone metabolism might be due merely to reduced food intake following dioxin administration, rats were given dioxin at 200 mg/kg and food withdrawn immediately. The hexobarbitone sleeping time of dioxin-treated rats was still significantly greater than that of controls when measured one day later. The hexobarbitone sleeping time of rats which had recovered from observable effects of dioxin, 89 days after administration, was not significantly different from that of their controls. No significant differences between the sexes were noted in inhibition of hexobarbitone metabolism, in contrast to effects previously observed with thyroxin. Dioxin has simultaneous stimulatory and inhibitory effects on different pathways of oxidative drug metabolism in the liver.

73-1400. Franklin, M. R. (Dept. of Biochem., Univ. of Texas, Med. School, Dallas, TX 75235). **Inhibition of hepatic oxidative xenobiotic metabolism by piperonyl butoxide.** *Biochem. Pharmacol. 21(24): 3287-3299; 1972.* (14 references)

The oxidative metabolism of piperonyl butoxide to a metabolite which forms a complex with reduced cytochrome P-450 is not inhibited by cyanide, but is prevented by the mercurial mersalyl. The apparent *K*m for this oxidation of piperonyl butoxide is low, being 65 μM. The inhibition of ethylmorphine *N*-demethylation by piperonyl butoxide in vitro is proportional to the amount of cytochrome P-450 present as the cytochrome P-450 piperonyl butoxide metabolite complex. Piperonyl butoxide shows mixed inhibition kinetics when present during ethylmorphine *N*-demethylation, i.e. competitive during the formation of the piperonyl butoxide metabolite, and noncompetitive once the metabolite is complexed with cytochrome P-450. Differences in the rate of formation of the piperonyl butoxide metabolite-cytochrome P-450 complex in liver microsomes from rats and mice can account for the greater sensitivity of mice to piperonyl butoxide inhibition of drug metabolism. Enhancement of absorption spectra in turbid solutions, such as piperonyl butoxide dispersions, is examined and discussed. (Author abstract by permission)

73-1401. Kacew, S.; Singhal, R. L. (Dept. of Pharmacol., Univ. of Ottawa, Fac. of Med., Ottawa, Canada K1N 6N5). **Adaptive response of hepatic carbohydrate metabolism to oral administration of *p,p'*-1,1,1-trichloro-2,2-*bis*(*p*-chlorophenyl)ethane in rats.** *Biochem. Pharmacol. 22(1): 47-57; 1973.* (34 references)

The effects of an acute dose of *p,p'*-1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)-ethane (*p,p'*-DDT) have been investigated on the activities of pyruvate carboxylase, phosphoenolpyruvate carboxykinase, fructose 1,6-diphosphatase, and glucose 6-phosphatase in rat liver. Administration of *p,p'*-DDT (600 mg/kg, p.o.) produced 2- to 2.5-fold stimulation of these key gluconeogenic enzymes in 5 hr, although statistically significant increases could be detected at 1 hr. Blood glucose increased as early as 0.5 hr, attained peak values at 1 hr, and then declined to reach control levels in 3-5 hr. In contrast, hepatic glycogen decreased gradually to 47 per cent of the control values in 1 hr, and was restored by 3 hr following treatment with this insecticide. Administration of *p,p'*-DDT to adrenalectomized rats produced similar changes in blood glucose and hepatic glycogen, suggesting that the insecticide-induced hyperglycemia and glycogenolysis may not be mediated by a release of

catecholamine from the adrenals. Dose-response studies revealed that 100 mg/kg of *p,p'*-DDT was the minimal amount necessary to induce statistically significant increases in the activities of hepatic pyruvate carboxylase, phosphoenolpyruvate carboxykinase, fructose 1,6-diphosphatase, and glucose 6-phosphatase. Maximal stimulation of the four key gluconeogenic enzymes was seen generally at 5 hr when rats were treated with a 400-600 mg/kg dose of *p,p'*-DDT. Daily administration of small doses of *p,p'*-DDT (5 or 25 mg/kg) for 45 days also resulted in significant enhancement in the activities of various hepatic gluconeogenic enzymes. Actinomycin D, cycloheximide or ethionine failed to affect the basal levels of either of the hepatic enzymes, but effectively reduced the insecticide-induced increases in various enzyme activities. Treatment of adrenalectomized rats with *p,p'*-DDT enhanced various hepatic enzymes to a degree similar to that observed in intact animals. Futhermore, administration of triamcinolone to *p,p'*-DDT-treated adrenalectomized rats did not potentiate the action of the insecticide on any of the gluconeogenic enzymes examined. Our results suggest that treatment with *p,p'*-DDT produces marked increases in the quartet of key, rate-limiting gluconeogenic enzymes in hepatic tissue which are not mediated through a release of corticosteroids from adrenal glands. (Author abstract by permission)

73-1402. Barzu, T.; Cuparencu, B.; Hantz, A. (Dept. of Pharmacol. Med. and Pharm. Inst., Cluj, Rumania). **Action of organophosphorus compounds on cell organelles. I. Effect of tetraethyl dithio pyrophosphate on lysosomal hydrolases.** *Biochem. Pharmacol. 22(2): 185-194; 1973.* (23 references)

The effect of asymmetric tetraethyl dithio pyrophosphate, a potent anticholinesterase compound, on rat brain and liver acid hydrolases from lysosomes was studied in vivo and in vitro. In both situations activation of "latent" acid hydrolases and labilization of lysosomal membrane have been observed. Three other derivatives, tetraethyl pyrophosphate, tetraethyl monothiono pyrophosphate, and tetraethyl dithiono pyrophosphate were tested for anticholinesterase action as well as for the action on cell organelles. The correlation between the data obtained in vivo and in vitro, as well the relationship between this effect and anticholinesterase power is discussed. (Author abstract by permission)

73-1403. Zayed, S. M. A. D.; Fakhr, I. M. I.; Bahig, M. R. E. (Nat. Res. Cent., Dokki, Cairo, Egypt). **Metabolism of organophosphorus insecticides. XII. Degradation of ^{32}P-malathion in the adult larva of the cotton leaf worm.** *Biochem. Pharmacol. 22(3): 285-292; 1973.* (24 references)

The metabolism of malathion in the adult larva of the cotton leaf worm (*Spodoptera littoralis*) has been investigated in vivo using ^{32}P-labeled insecticide. After 24 hr, about 90 per cent of the applied dose is metabolized. The oxidation of P=S to P=O and the phosphatase action represent the most important degradation pathways of the insecticide. Eight metabolites have been isolated and identified. (Author abstract by permission)

73-1404. Feytmans, E.; Leighton, F. (Dept. de Biol. Celular, Univ. Catolica de Chile, Casilla 114-D, Santiago, Chile). **Effects of pyrazole and 3-amino-1,2,4-triazole on methanol and ethanol metabolism by the rat.** *Biochem. Pharmacol. 22(3): 349-360; 1973.* (52 references)

The metabolism of methanol-^{14}C and ethanol-1-^{14}C in rats was evaluated from the rates of $^{14}CO_2$ production. 3-Amino,1,2,4-triazole (amitrole), a known catalase inhibitor, decreased by 10 and 35 per cent the rates of oxidation of ethanol and methanol whereas pyrazole, an alcohol dehydrogenase inhibitor, decreased the rates 85 and 50 per cent respectively. However, the simultaneous use of both inhibitors gave the same effects produced by pyrazole alone. Thus the relative contribution in vivo to alcohol metabolism of rat liver alcohol dehydrogenase and catalase-mediated peroxidation cannot be estimated only in this way. Rat liver alcohol dehydrogenase was purified 14.7 times. At pH 7.0 and 30°, the *Km* for methanol was 340 mM and for ethanol 0.26 mM. The *V*max/*e* was 2.36 nM for methanol and 22.3 nM for ethanol (NADH $\times$ U^{-1} $\times$ l^{-1} $\times$ sec^{-1}). 3-Amino-1,2,4-triazole inhibited the purified enzyme with a *KI* of 55 mM for methanol and 33 mM for ethanol. The *KI* of pyrazole was 2.3 mM for methanol and 2.2 mM for ethanol. The amount of alcohol dehydrogenase present in rat liver, with the found kinetic constants, can account for the ethanol oxidation in vivo, but fails to account, as methanol dehydrogenase, for the observed pyrazole-sensitive methanol oxidation. A mechanism for the complete oxidation of methanol to CO_2 and water through the concerted action of catalase and alcohol dehydrogenase is suggested. 3-Amino-1,2,4-triazole in a dose of 1 g/kg decreases more than 90 per cent of the catalatic activity of catalase, but under certain conditions in vitro, only about 50 per cent of the peroxidative activity of catalase towards methanol and ethanol. Consequently, the degree of catalase-mediated peroxidation should not be controlled or estimated from the residual catalatic activity when using catalase inhibitors. Pyrazole, at a dose of 0.3 g/kg, does not affect catalase activity 1 hr after administration, but decreases it more than 90 per cent after 24 hr. This effect is completely prevented in the presence of alcohol. (Author abstract by permission)

73-1405. Gzik, A.; Graeser, H. (Sektion Chemie/Biologie, Paedagogische Hochschule "Karl Liebknecht," Potsdam, DDR). **Untersuchungen zur Metabolisierung des Simazins in etiolierten Keimpflanzen von *Zea mays*. [The metabolism of simazine by etiolated seedlings of**

Zea mays.] *Biochem. Physiol. Pflanzen 163(5): 483-491; 1972.* (25 references) (German)

The metabolism of ^{14}C-labeled ethyl simazine and 2,4,6-simazine by etiolated seedlings of *Zea mays* was studied in a 260-hour experiment. Extraction and purification of simazine and its metabolites from plant materials was done by thin-layer chromatography. Intense hydroxylation of simazine into hydroxy simazine by an endogenous catalyst (2,4-dihydroxy-7-methoxy-1,4-benzoxazine-3-one) was observed; nevertheless, intact simazine was detected in roots and sprouts over extended periods. The rate of degradation of lateral chains was more intense than that of rings. A way of degradation over hydroxy simazine, 2-hydroxy-4-amino-6-ethylamino-*s*-triazine, ammeline, ammelide, and cyanuric acid prior to ring decomposition, and further to carbon dioxide and ammonia is proposed. The fragments formed in the course of degradation are either used during biosynthesis or transpired. Nonspecific incorporation of such fragments in all free amino acids was observed. All simazine metabolites are inactive, including hydroxy simazine. The high tolerance of corn plant for simazine is attributed to the high rate of simazine metabolism.

73-1406. Taljaard, J. J. F.; Shanley, B. C.; Deppe, W. M.; Joubert, S. M. (Dept. Chem. Pathol., Fac. Med., Univ. Natal, Durban, S. Africa). **Porphyrin metabolism in experimental hepatic siderosis in the rat.** *Brit. J. Haematol. 23(5): 587-593; 1972.* (17 references)

Previous studies have shown that an experimental symptomatic porphyria is produced in rats by a combination of iron overload and hexachlorobenzene (HCB). In siderotic rats treated with HCB for 55 days, no measurable liver uroporphyrinogen decarboxylase activity was observed. Nonsiderotic animals treated with HCB or HCB/dextran exhibited normal conversion of uroporphyrinogen to coproporphyrinogen. Incorporation of the label of [2,3-^{14}C]-succinate into liver heme was normal in the nonsiderotic, HCB- and HCB/dextran treated animals, but was about half the normal value in the HCB/Fe treated animals. Normal amounts of microsomal cytochromes P450 and b5 were found in HCB/dextran treated animals while a significant reduction in these two cytochromes was observed in rats treated with HCB/Fe. Cytochrome P450, but not b5, was reduced in rats made porphyric with allylisopropylacetamide. The NAD/NADH ratios were 2.4 to 2.9 times the normal value in all of the HCB-treated rats. The results suggest that the primary effect of HCB regarding heme liver biosynthesis may be the change in redox state, which could lead to a decreased ability to maintain prophyrinogens in the reduced form, and that the effect of iron overload is mediated by reduction of uroporphyrinogen decarboxylase activity and an increase in the degradation of microsomal drug detoxifying cytochromes.

73-1407. Hansen, D. J.; Matthews, E.; Nall, S. L.; Dumas, D. P. (Gulf Breeze Lab., Sabine Island, Gulf Breeze, FL 32561). **Avoidance of pesticides by untrained mosquitofish, *Gambusia affinis*.** *Bull. Environ. Contam. Toxicol. 8(1): 46-51; 1972.* (6 references)

Mosquitofish exhibited some capacity under laboratory conditions to avoid water containing pesticides. At least one concentration less than the 24-hr LC50 of Dursban (chlorpyrifos), malathion, carbaryl, and 2,4-D were avoided. The fish avoided DDT at concentrations of 0.1 and 1.0 ppm and did not respond to any of the concentrations of endrin tested. Less than 70% of the fish avoided the concentrations tested except for 10.0 and 1.0 ppm Dursban and 10 ppm 2,4-D. The mosquitofish preferred the higher concentration of DDT to the lower, sought the concentration of Dursban and 2,4-D below 1.0 and 10 ppm respectively, and did not discriminate between different concentrations of malathion, carbaryl, or the concentrations of DDT, Dursban, or 2,4-D not already mentioned.

73-1408. Hogan, J. W.; Knowles, C. O. (Fish-Pestic. Res. Lab., U.S. Bureau of Sport Fish. and Wildlife, Columbia, MO). **Metabolism of diazinon by fish liver microsomes.** *Bull. Environ. Contam. Toxicol. 8(1): 61-64; 1972.* (9 references)

All hepatic subcellular fractions obtained from channel catfish metabolized diazinon when exogenous NADPH was added. The rate of metabolism was most rapid during the first 30 min of incubation. Maximum activity was exhibited by the microsomes, which metabolized about 15% of the 30 nmoles of diazinon added to diazoxon and water-soluble metabolites (mostly diethylphosphorothioic acid and diethyl phosphoric acid) in two hours. The reactions were probably catalyzed by the NADPH-cytochrome P450 mixed function oxidase system since NADPH and oxygen were required. Addition of GSH did not markedly increase metabolism, suggesting only a minor role for GSH-dependent enzymes. Similar results were obtained with bluegill liver preparations.

73-1409. McLane, M. A. R.; Hall, L. C. (Patuxent Wildlife Res. Cent., Laurel, MD). **DDE thins screech owl eggshells.** *Bull. Environ. Contam. Toxicol. 8(2): 65-68; 1972.* (9 references)

Screech owls fed 2.8 ppm DDE in the diet laid eggs with shells that were 12% thinner than in the previous year when fed an untreated diet. Eggshells of birds fed untreated diet during both years did not differ from year to year. The group of birds fed DDE laid eggs with shells 13% thinner than those of birds fed untreated diet in the same year. Eggshell thinning as a result of DDE administration has been observed previously in two major bird groups. This experiment indicates the potential that DDE has for impairing reproduction in a third major bird group, the Order Strigiformes.

73-1410. Davis, P. W.; Friedhoff, J. M.; Wedemeyer, G. A. (Dept. Pharmacol., Univ. Washington School Med. and Western Fish Dis. Lab., Dept. of Interior, Seattle, WA). **Organochlorine insecticide, herbicide, and polychlorinated biphenyl (PCB) inhibition of NaK-ATPase in rainbow trout.** *Bull. Environ. Contam. Toxicol. 8(2): 69-72; 1972.* (10 references)

Organochlorine inhibition of ATPase activities of a heavy microsomal fraction of trout gill homogenate ranged from 77% for chlordane to almost zero for mirex at concentrations of $10^{-4}M$ or 40 ppm. Chlordane, heptachlor, TDE, aldrin, DDT, and toxaphene inhibited NaKMg-ATPase at substantially lower concentrations. Arochlors 1254 and 1242 produced at least 25% inhibition at 40 ppm, and 2,4-D and 2,4,5-T had no effect. A general depression of NaKMg-ATPase, NaK-ATPase, and Mg-ATPase was observed rather than selective inhibition. Since the most active inhibitors were those with the greatest solubility in organic solvents, lipid(membrane) solubility may affect the inhibition of ATPase by these compounds. The insecticides were more toxic and better ATPase inhibitors than the herbicides, but within the insecticide group no correlation existed between inhibition and toxicity. In vivo experiments failed to reveal any difference in ATPase activity between animals dosed with 5 or 10 mg/kg DDT and controls.

73-1411. Knowles, C. O.; Sonawane, B. R. (Dept. Entomol., Univ. Missouri, Columbia, MO 65201). **Ethyl *m*-hydroxycarbanilate carbanilate (EP-475) metabolism in sugar beets.** *Bull. Environ. Contam. Toxicol. 8(2): 73-76; 1972.* (2 references)

Chloroform leaf rinses contained the majority of radioactive materials for 0 to 90 days after topical treatment of sugar beet plants with labeled ethyl *m*-hydroxycarbanilate carbanilate (EP-475). After 90 days 27.1% of the radioactivity was in the form of the parent compound. Ethyl-*N*-hydroxyphenylcarbamate was the major metabolite, but some *m*-aminophenol was also found. Combustion of rinsed leaves revealed the presence of some unextractable radioactivity. A slight amount of EP-475 equivalents was observed in the roots 60 days after treatment.

73-1412. Miyazaki, S.; Thorsteinson, A. J. (Dept. Entomol., Univ. Manitoba, Winnipeg, Canada R3T 2N2). **Metabolism of DDT by fresh water diatoms.** *Bull. Environ. Contam. Toxicol. 8(2): 81-83; 1972.* (13 references)

Of 10 diatom cultures isolated from ditch water, two *Nitzschia* species and an unidentified species metabolized DDT. DDE was the only metabolite observed and most of the DDT added to the cultures remained unchanged after two weeks. Total radioactivity recovered from the diatom culture media was less than from the control, suggesting some of the DDT or its metabolites was bound intracellularly or could not be extracted by the solvent system used. The results suggest that some species of fresh-water diatoms may contribute to the degradation of DDT to DDE in the aquatic environment.

73-1413. Morgan, J. R. (College of Fisheries, Univ. Washington, Seattle, WA). **Effects of Aroclor 1242 (a polychlorinated biphenyl) and DDT on cultures of an alga, protozoan, daphnid, ostracod, and guppy.** *Bull. Environ. Contam. Toxicol. 8(3): 129-137; 1972.* (14 references)

Five aquatic organisms were grown in the presence of various concentrations of Aroclor 1242 and DDT. Aroclor-containing cultures of *Chlamydomonas* took a much longer time to approach the cell density of the controls. A delay before exponential growth and an initial drop in population were observed with the two highest doses. A dose related decrease in ^{14}C uptake occurred in cultures containing the polychlorinated biphenyls. DDT in concentrations from 0.2 ppm to 20 ppm did not appreciably alter the growth curves of *Chlamydomonas* or the uptake of ^{14}C. Neither chemical had an effect on the growth rate or population size of *Tetrahymena vorax*, but Aroclor was fairly toxic to *Daphnia pulex*. At 20 ppm Arclor 1242 was more toxic than DDT to the ostracod, *Cypridopsis vidua*, while at lower concentrations DDT was the most toxic. Young guppies (*Poecilia reticulata*) died in 2 ppm Aroclor. In Daphnia fed algae cells grown in media containing 24 ppm Aroclor 1242 100% mortality was observed, indicating concentration of the polychlorinated biphenyls in the food chain.

73-1414. Heidker, J. C.; Pardini, R. S. (Div. Biochem., Univ. Nevada, Reno, NV 89507). **Inhibition of mitochondrial electron transport by guthion, some related insecticides, and degradative products.** *Bull. Environ. Contam. Toxicol. 8(3): 141-146; 1972.* (9 references)

Ethyl guthion, guthion (azinphosmethyl), ethyl guthion oxygen analog and guthion oxygen analog at a concentration of 138.9 nmol/mg of mitochondrial protein depressed mitochondrial NADH-oxidase activity to 32, 53, 86, and 88% of controls. A 10 fold increase in the concentration of each inhibitor gave respective values of 6, 12, 31, and 80% of control activity. No inhibition was observed with benzazimide and anthranilic acid. At 1282 nmol/mg of mitochondrial protein none of the chemicals inhibited succinoxidase activity more than 30%. The results suggest that ethyl guthion, guthion, and guthion and ethyl guthion oxygen analogs inhibit mitochondrial NADH-oxidase activity in the Complex I region of the electron transport chain. I50 values calculated from titration curves for the inhibition of mitochondrial NADH-oxidase indicate that ethyl guthion is twice as potent as guthion and both phosphorodithioates are more potent than the oxygen

analogs. Disulfoton, an aliphatic phosphorodithioate, inhibited the NADH-oxidase system, while dylox, an aliphatic phosphonate, did not.

73-1415. Radhakrishnan, C. V.; Thompson, N. P.; Forrester, D. J. (Dept. Vet. Sci., Univ. Florida, Gainesville, FL 32601). **Susceptibility of chickens fed *p,p'*-DDT to histomoniasis.** *Bull. Environ. Contam. Toxicol. 8(3): 147-152; 1972.* (9 references)

All *H. gallinarum*-treated chickens given 30 and 50 mg/kg DDT orally on alternate days from 8 to 38 days of age and 94% of the birds given 10 mg/kg DDT showed pathologic lesions of histomoniasis; control birds and those given *H. gallinarum* but not DDT contained no lesions on the 30th day of the experiments. The disease is caused by the protozoan *H. meleagridis* which is transmitted by *H. gallinarum*. Susceptibility in chickens is generally low. A direct correlation was observed between residues of DDT and its metabolites and administered doses of *p,p'*-DDT. DDT may have retarded the development of *H. gallinarum* larvae and thus the release of histomonads, affected the development of immunity to histomoniasis, or affected the bacterial flora resulting in observed changes in susceptibility. It is possible that lesions in control birds had regressed by the 30th day. The experiment demonstrated that sublethal levels of a persistent insecticide can interact with a disease agent.

73-1416. Langlois, B. E.; Sides, K. G. (Dept. Anim. Sci., Food Sci. Sect., Univ. Kentucky, Lexington, KY 40506). **Effect of heptachlor and related compounds on growth of *Staphylococcus aureus*.** *Bull. Environ. Contam. Toxicol. 8(3): 158-164; 1972.* (4 references)

Purified chlordane, 99.8% γ-chlordane, 99.5% Nonachlor and 72, 73, 74, 99, and 99.8% heptachlor all caused a fairly rapid decrease in the number of *Staphylococcus aureus* added to trypticase soy broth. Pesticides containing at least 99% heptachlor caused the smallest decrease (8.3%); 99.8% γ-chlordane caused the largest (51.1%); and 72 and 74% heptachlor decreased the count by 42%. The lag period before growth was 2 hr for control, solvent and Nonachlor, 4 to 8 hr for 99% or more heptachlor, and 24 hr for chlordane. The average increase in generation time ranged from 3 min for alcohol to 324.5 min for chlordane. No correlation was observed between decrease in initial count and generation time. The results suggest that the amount of chlordane and γ-chlordane rather than heptachlor in technical heptachlor pesticides governs the viability of *S. aureus*. The overall decrease in population was less where a larger inoculum was used, supporting the suggestion the bacterial protein has a protective effect. The growth of *S. aureus* was not affected by heptachlor or chlordane when skim milk was used in place of trypticase soy broth.

73-1417. Flickinger, E. L.; Meeker, D. L. (U.S. Bureau of Sport Fish. Wildlife, Victoria, TX). **Pesticide mortality of young white-faced ibis in Texas.** *Bull. Environ. Contam. Toxicol. 8(3): 165-168; 1972.* (6 references)

Nesting attempts in 1970 in three white-faced ibis colonies in Texas were almost complete failures. Most of the young were found dead and those that remained exhibited muscular weakness, jerkiness, fluffed feathers, and drooping wings. Dying birds exhibited symptoms typical of dieldrin poisoning; rice fields where the birds fed extensively were planted with seed treated with aldrin and methylmercury fungicides. Determination of organochlorine residues in three dying and four dead ibis revealed a low level of DDE and dieldrin concentrations of 0.4 to 8.0 ppm in the brain and 0.3 to 6.7 ppm in the body. Most of the levels were sufficient to cause severe dieldrin poisoning. Significant exposure to mercury was indicated by kidney residues of 0.98 to 2.0 ppm observed in four dead young; this may have contributed to mortality.

73-1418. Wassermann, M.; Wassermann, D.; Kedar, E.; Djavaherian, M.; Cucos, S. (Dept. Occup. Health, Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel). **Effects of dieldrin and gamma BHC on serum proteins and PBI.** *Bull. Environ. Contam. Toxicol. 8(3): 177-185; 1972.* (8 references)

Rabbits treated with dieldrin or γ-BHC (lindane) at 50 ppm in the drinking water had a reduced response of the 7S fraction of serum gamma globulin after *Salmonella typhi* administration. Animals receiving dieldrin and γ-BHC showed a significant increase in serum albumin which was inhibited when *Salmonella typhi* was also administered. Animals treated with *Salmonella typhi* and either pesticide had plasma pesticide levels lower than those of pesticide-treated controls. Previous studies have also demonstrated a bidirectional metabolic relationship between detoxification of an organochlorine pesticide or other foreign compound in the presence of an antigen and the response of an animal to an antigen in the presence of a foreign compound. Dieldrin, γ-BHC or *Salmonella typhi* alone and in combination with either pesticide significantly decreased serum protein bound iodine levels. A significantly smaller weight gain was observed in dieldrin-treated animals.

73-1419. Mailman, R. B.; Hodgson, E. (Dept. Entomol., N. Carolina State Univ., Raleigh, NC 27607). **The cytochrome P-450 substrate optical difference spectra of pesticides with mouse hepatic microsomes.** *Bull. Environ. Contam. Toxicol. 8(3): 186-192; 1972.* (26 references)

The type of binding spectra obtained on combination of mouse liver microsomes with various pesticides did not follow classical chemical grouping of the pesticides. Both type I and type II binding was observed with all but the chlorinated aryl hydrocarbons. Type II

compounds have the common structural units of a nitrogen atom relatively unhindered spatially with respect to other substituted groups and probably bind to heme. Menazon, Zinophos (thionazin), amitrole, and 1-(1-naphthyl)-imidazole gave type II spectra, while carbaryl, picloram, and monitor did not. Thannite (isobornyl thiocyanatoacetate), however, which was expected to form a type II spectrum, yielded a type I spectrum, indicating that other factors may affect binding. Aromatic compounds generally formed type I spectra, indicating that the cytochrome P-450 type I site is a hydrophobic region.

73-1420. Porter, R. D.; Wiemeyer, S. N. (Patuxent Wildlife Res. Cent., Laurel, MD). **DDE at low dietary levels kills captive American kestrels.** *Bull. Environ. Contam. Toxicol. 8(4): 193-199; 1972.* (24 references)

In a study of 14 American kestrels, two died after 14 and 16 months on a diet containing 2.8 ppm *p,p'*-DDE. Residues of 213 and 301 ppm DDE were found in the brains of the two dead birds while an average of 14.9 ppm was observed in birds sacrificed after 12 to 16 months on the DDE diet. Less than 1.7 ppm DDT, TDE, and dieldrin combined were found in brains of birds that died. A 30 to 35% weight loss and grossly reduced pectoral muscles and badly depleted fat reserves were observed. No evidence of other causes of death was found at autopsy. The study demonstrated a concentration of DDE in kestrel brains in lethal amounts during a period of seasonal weight loss, suggesting that direct poisoning due to DDE may be a factor which contributed to recent declines of raptorial and piscivorous populations.

73-1421. Khan, M. A. Q.; Kamal, A.; Wolin, R. J.; Runnels, J. (Dept. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL 60680). **In vivo and in vitro epoxidation of aldrin by aquatic food chain organisms.** *Bull. Environ. Contam. Toxicol. 8(4): 219-228; 1972.* (13 references)

Laboratory investigations demonstrated the concentration and metabolism of aldrin by aquatic microorganisms and freshwater invertebrates in the food chain. Algae tested formed dieldrin in smaller amounts than protozoa. The small invertebrates, *Gammarus, Dugensia, Cyclops, Asellus,* and *Daphnia* contained total aldrin/dieldrin residues of 21.5 to 28.8 ng/animal after exposure to 0.1 ppm aldrin for two hr. A total of 684.7 ng/animal was found in mussels exposed to 0.25 ppm aldrin in a liter of water for four hr. Other organisms had intermediate residue levels and all showed some dieldrin formation. Dragonfly nymphs and mosquito larvae were most active in this respect. The mixed function oxidase activity was present in gut, liver, kidneys, and nervous tissue of crayfish, snails, and clams, and about 80% of the liver activity was found in the microsomes. The enzymes in each of these animals are presently being characterized.

73-1422. Rosenkranz, H. S. (Dept. Microbiol., College of Physicians and Surgeons, Columbia Univ., New York, NY 10032). **Formaldehyde as a possible carcinogen.** *Bull. Environ. Contam. Toxicol. 8(4): 242-244; 1972.* (14 references)

Formaldehyde impregnated on a sterile disc preferentially inhibited the growth of *E. coli* pol A^- strain over the growth of *E. coli* pol A^+. The difference was small, but reproducible, indicating that formaldehyde reacts with DNA and other cellular structures. Preferential inhibition of the pol A^- strain was also exhibited by the carcinogens methyl methanesulfonate and *N*-hydroxylaminofluorene. Based on this method of evaluation of potential mutagens and carcinogens which has been shown to be quite reliable, formaldehyde could be hazardous at low levels over prolonged periods of time. Its universal use as an insecticide, fungicide, and germicide should be monitored and reevaluated.

73-1423. Lewin, V.; McBlain, W. A.; Wolfe, F. H. (Dept. Zool., Univ. Alberta, Edmonton, Alberta, Canada). **Acute intraperitoneal toxicity of DDT and PCB's in mice using two solvents.** *Bull. Environ. Contam. Toxicol. 8(4): 245-250; 1972.* (29 references)

DDT was considerably more toxic (LD50 of 280 mg/kg) than polychlorinated biphenyls (LD50 of 2840 mg/kg) when administered to mice in corn oil. The concentration of the corn oil solution affected the LD50 observed. The response to DDT administered in DMSO was significantly lower in CBA strain mice but did not vary with the other strains tested. DDT and polychlorinated biphenyls in DMSO had LD50s in the same range (730 to 1200 mg/kg) for most strains, although in the BALB strain a significant difference in toxicity was observed. Hyperexcitability, tremors, and convulsions preceded death in the case of DDT poisoning. Aroclor-treated mice did not exhibit those symptoms, but were inactive prior to death. DMSO-treated controls were inactive for 4 to 6 hr and then resumed normal behavior.

73-1424. Hunt, L. M.; McCarty, R. T. (Toxicol. Res. Lab., Vet. Sci. Res. Div., Agr. Res. Serv., U. S. Dept. of Agr., Kerrville, TX 78028). **Effects of some organophosphorus insecticides on vitamin E and other blood constituents and on the apparent inducement of diarrhea in neonatal calves.** *Bull. Environ. Contam. Toxicol. 8(5): 297-305; 1972.* (19 references)

Neonatal calves exposed to a significant level of various organophosphate insecticides had reduced plasma tocopherol levels which generally coincided with the onset of diarrhea. Animals dosed with coumaphos as a drench at 25 mg/kg had maximum decreases of 79, 80, and 100% in total, free, and ester tocopherol. Diarrhea, depressed ChE, and decreased PCV and fatty acid and

carotene levels accompanied the reduction in tocopherol; these levels did not return to normal within the 14-day experiment. Demeton, given orally at 0.5, 1.0, and 1.5 mg/kg on days 1, 3, and 4, respectively, caused maximum decreases in total, free, and ester tocopherol of 43, 76, and 77%. Diarrhea, lower tocopherol, carotene, ChE, and PCV were observed in 3 of the 5 calves tested. All five calves exhibited a drop in PCV which persisted throughout the experiment. All calves dosed orally or dermally with other organophosphates had a persistent reduction in tocopherol. When the level remained below 70 μg/100 ml for several days, the calves showed an inability to recover pretreatment levels of fatty acids, carotene, and hematocrits.

73-1425. Mathre, D. E. (Dept. Botany Microbiol., Montana State Univ., Bozeman, MT 59715). **Effects of oxathiin systemic fungicides on various biological systems.** *Bull. Environ. Contam. Toxicol. 8(5): 311-316; 1972.* (18 references)

The effects of carboxin, its monoxide, and its dioxide were investigated on several non-target organisms. Growth of a number of bacteria was inhibited from 0 to 10% at $10^{-4}M$ carboxin. This concentration of each of the compounds did not affect the development of sporangia by the slime mold *D. discoideum*. Oxycarboxin affected formation and stability of cell sheets of the human Hep 2 cells although carboxin or its monoxide did not. No lysis of rabbit red blood cells was observed with $10^{-4}M$ carboxin or its oxidized products, but a 15% inhibition in ^{14}C-acetate metabolism was detected. ^{14}C-acetate metabolism in *Chlorella* was not inhibited by these compounds at $10^{-4}M$. However, photosynthesis was inhibited 52% with carboxin at $10^{-4}M$. Concentration of $10^{-4}M$ or more inhibited growth of barley, pinto beans, and soybeans. Photosynthesis in these plants was also inhibited when the fungicide was applied to leaf surfaces at $10^{-4}M$ or higher. Carboxin had the greatest effect.

73-1426. Keil, J. E.; Sandifer, S. H.; Finklea, J. H.; Priester, L. E. (Preventive Med. Sect., Med. Univ. South Carolina, Charleston, SC 29401). **Serum vitamin A elevation in DDT exposed volunteers.** *Bull. Environ. Contam. Toxicol. 8(5): 317-320; 1972.* (4 references)

Twenty-one volunteers exposed to DDT for at least five years had serum vitamin A and DDT, DDE, and TDE levels significantly higher than controls matched by sex, age, and race. Vitamin A levels were within the normal range in both groups. Average pesticide levels in exposed subjects were 21 ppb DDT, 4 ppb TDE, and 13 ppb DDE. The corresponding values in nonexposed subjects were 3, 1, and 4 ppb. A significant positive linear correlation was observed for vitamin A with DDT and its principal metabolites. The correlation may simply reflect an effect of general pesticide exposure or may be a result of the lipid solubility of the two compounds.

73-1427. Plestina, R.; Davis, A.; Bailey, D. R. (Inst. for Med. Res., Yugoslav Acad. of Sci. and Arts, Zagreb, Yugoslavia). **Effect of metrifonate on blood cholinesterases in children during the treatment of schistosomiasis.** *Bull. WHO 46(6): 747-759; 1972.* (38 references)

In a controlled clinical trial, Tanzanian schoolchildren with urinary schistosomiasis, many of whom had coexisting hookworm infection, were randomly allocated to one of three groups that were treated with doses of 7.5, 10.0, and 12.5 mg per kg of body weight, respectively, of metrifonate (trichlorfon) orally, up to 3 times at 14-day intervals. No serious side effects were observed during or after the administration of single or repeated doses. A few hours after medication, plasma cholinesterase was almost completely inhibited, regardless of the dose given, while erythrocyte cholinesterase was inhibited down to 40-60% of the pretreatment level, depending on the dose. Plasma cholinesterase was inhibited to a greater extent than erythrocyte cholinesterase but showed a more rapid recovery of activity. A moderate accumulation of unreactivated erythrocyte cholinesterase occurred at all dose levels with this regime. Four weeks after the last dose of drug, plasma cholinesterase activity returned to normal 8-15 weeks after the last dose. The therapeutic results confirmed the efficacy of metrifonate against *Schistosoma haematobium*. There was an additional though less striking effect against hookworm. (Author abstract by permission)

73-1428. Belzile, L.; Paquin, R.; Willemot, C. (Ferme Exp. Min. de l'Agr. du Canada, La Pocatiere, Quebec, Canada). **Absorption, translocation et metabolisme du chlorure de (2-chloroethyl) trimethylammonium 1,2-14C chez l'orge d'hiver (*Hordeum vulgare*). [Absorption, translocation, and metabolism of (2-chloroethyl) trimethylammonium-1,2-14C chloride in winter barley (*Hordeum vulgare*).]** *Can. J. Bot. 50(12): 2665-2672; 1972.* (19 references) (French)

Absorption, translocation, and metabolism of ^{14}C-labeled (2-chloroethyl) trimethylammonium-1,2 chloride (CCC) was studied in winter barley (*Hordeum vulgare*). CCC was weakly metabolized by winter barley; 0.3% of the initial radioactivity was found in the form of phosphatidyl choline. Traces of radioactivity were also found in choline and in other unidentified, ethanol-soluble compounds. CCC was absorbed more readily by the roots than by the leaves and accumulated preferentially in the meristemic tissues.

73-1429. Ho, M.; Gibson, M. A. (Dept. of Biol., Acadia Univ., Wolfville, Nova Scotia, Canada). **A histochemical study of the developing tibiotarsus in malathion-treated chick embryos.** *Can. J. Zool. 50(10): 1293-1298; 1972.* (14 references)

Chick embryos were exposed to a teratogenic dose of malathion at five days of incubation. The treated

tibiotarsi developed micromelia, an asymmetrical deposition of bone spicules, and sites of reduced matrix within the cartilage model. The major histochemical differences occurred in the areas of reduced cartilage matrix. These included a reduction in sulfated mucopolysaccharide and ribonucleic acid content and an increased glycogen storage. Calcification was more extensive in the treated tissues and premature centers of mineralization appeared within the epiphyses. Alkaline phosphatase was associated with sites of ossification and calcification and was, therefore, more extensively distributed in the treated tissues. (Author abstract by permission)

73-1430. Krampitz, G.; Hardebeck, H. (Inst. Anat. Physiol. Haustiere, Universiatet Bonn, Bonn, Germany). **Ueber den Einfluss von polychlorierten Kohlenwasserstoffen auf den Stoffwechsel von Warmbluetern. II. Mitteilung: Ueber den Stoffwechsel von DDT and verwandten Verbindungen. [The influence of polychlorinated hydrocarbons on the metabolism in warm-blooded animals. II. Communication: The metabolism of DDT and related compounds.]** *Deut. Tieraerztl. Wochenschr. 80(4): 82-85; 1973.* (German)

Studies on the metabolism of DDT, aldrin, and dieldrin in warm-blooded animals are reviewed. Polychlorinated pesticides are partly transformed into water-soluble compounds by microorganisms of the digestive tract and hepatic enzymes although the metabolic processes do not break up the ring systems of the hydrocarbons. On the subcellular level, NADPH.H-dependent microsomal enzymes are necessary to transform polychlorinated pesticides into hydrophilic metabolites suitable for excretion. At least six different metabolites of dieldrin were distinguished in the urine. Dieldrin accumulates preferentially in bone marrow while DDT and its metabolites DDD (TDE), DDE, and DDA are retained by fatty tissues. Additional administration of aldrin increased the DDT and DDT metabolite levels in the blood and fatty tissues. DDT, dieldrin, and other organochlorine substances are accumulated in the organism by daily uptake until equilibrium between uptake and elimination is reached.

73-1431. Rice, C. P.; Sikka, H. C. (Life Sci. Div., Syracuse Univ. Res. Corp. Syracuse, NY 13210). **Uptake and metabolism of DDT by six species of marine algae.** *J. Agr. Food Chem. 21(2): 148-152; 1973.* (14 references)

The uptake and metabolism of DDT by six species of marine phytoplankton was studied. Uptake of DDT by various species increased linearly with an increasing concentration of DDT but nonlinearly with an increasing concentration of cells. The species with the higher numbers of cells per unit of mass took up greater amounts of DDT per unit weight than species with lower numbers of cells. All species concentrated DDT to levels many times higher than the original concentration in the medium. DDT was accumulated by the six species in the following order: *Skeletonema costatum* > *Cyclotella nana* > *Isochrysis galbana* > *Olisthodiscus luteus* > *Amphidinium carteri* > *Tetraselmis chuii.* All of the species converted small amounts of DDT to DDE. After 24 days of treatment, the amount of DDE produced by different species ranged from 0.03 to 12% of the total DDT in the cells. Maximum conversion of DDT to DDE was observed in cultures of *Tetraselmis.* (Author abstract reprinted by permission of the American Chemical Society)

73-1432. Hoffman, L.J.; Ross, J. H.; Menn, J. J. (Stauffer Chem. Co., Agr. Res. Cent., Mountain View, CA 94040). **Metabolism of 1-(4′-ethylphenoxy)-6,7-epoxy-3,7-dimethyl-2-octene (R 20458) in the rat.** *J. Agr. Food Chem. 21(2): 156-163; 1973.* (18 references)

Oral administration of *trans*-1-(4′-ethylphenoxy-^{14}C)-6,7-epoxy-3,7-dimethyl-2-octene (R 20458), an insect juvenile hormone analog, to rats resulted in the excretion of numerous urinary and fecal metabolites. Approximately 100% of the administered dose was recovered in equal amounts in urine and feces. No significant radiocarbon was detected in tissues or expired air. Metabolites were identified by chromatographic and spectrometric analyses. The chemical nature of the metabolites indicates that R 20458 is metabolized via the following biotransformations: α and ω oxidation of the 4′-ethyl moiety; hydration of the trans olefin; hydration of the 6,7-epoxy group; and ether cleavage. The results of this study indicate that R 20458 is a highly biodegradable compound which is unlikely to leave persistent or toxic residues in animals or the environment. (Author abstract reprinted by permission of the American Chemical Society)

73-1433. Potter, J. C.; Loeffler, J. E.; Collins, R. D.; Young, R.; Page, A. C. (Biol. Sci. Res. Cent., Shell Development Co., Modesto, CA 95352). **Carbon-14 balance and residues of dichlorvos and its metabolites in pigs dosed with dichlorvos-^{14}C.** *J. Agr. Food Chem. 21(2): 163-166; 1973.* (13 references)

One dose of dichlorvos-^{14}C (2,2-dichlorovinyl-1-^{14}C dimethyl phosphate) formulated as slow-release polyvinylchloride (PVC) pellets was fed as a top dressing to each of nine young male Yorkshire pigs. After treatment, three of the pigs were killed at each of the following intervals: 2 days, 7 days, and 14 days. In the 14-day trial 61.8% of the ^{14}C administered was found in the pellets recovered from the feces; 5.6% was found in the remainder of the feces; 3.6% was found in the urine; 14.1% was recovered from the expired air; and 9.6% remained in the carcass. The ^{14}C content of the tissues from the pigs in all the treatments ranged from 2 to 33 ppm equivalents of dichlorvos, but no dichlorvos, demethyl dichlorvos, dichloroacetaldehyde, and dichloroacetic acid were found in the tissues of the pigs. It is

concluded that the ^{14}C present in the tissues is the result of incorporation of C-1 and C-2 fragments from the vinyl moiety of dichlorvos into normal tissue constituents. (Author abstract reprinted by permission of the American Chemical Society)

73-1434. Stenersen, J. ; Gilman, A.; Vardanis, A.* (Res. Inst., Canada Dept. of Agr., University Sub Post Office, London 72, Ontario, Canada). **Carbofuran: Its toxicity to and metabolism by earthworm (*Lumbricus terrestris*).** *J. Agr. Food Chem. 21(2): 166-171; 1973.* (11 references)

The toxicity of the carbamate insecticide carbofuran to *L. terrestris* has been tested. The LD50 of injected material was 1.3 mg/kg, and when mixed in soil the LC50 was 12.2 ppm (5-day test period). Cholinesterase depression was less severe and recovery was faster for carbofuran-treated worms than for worms treated with paraoxon or Dasanit, although the latter two were less toxic. Characteristic symptoms of carbofuran poisoning were rigidity, immobility, sores, and segmental swellings, while only rigidity and immobility were observed after treatment with organophosphorus anticholinesterases. The toxicity of this insecticidal carbamate to earthworms may therefore be due to factors other than cholinesterase inhibition. Earthworms excreted carbofuran, mainly as the unchanged insecticide, its hydroxylated analog (3-hydroxycarbofuran), and at least two unidentified products. The earthworms were found to reabsorb excreted insecticide and its metabolites from a sand medium. The ^{14}C-labeled material was ultimately bound to some tissue component, not extractable with acetonitrile. (Author abstract reprinted by permission of the American Chemical Society)

73-1435. Schultz, D. P. (Southeastern Fish Control Lab., Bureau Sport Fish. and Wildl., Warm Springs, GA 31830). **Dynamics of a salt of (2,4-dichlorophenoxy)-acetic acid in fish, water, and hydrosol.** *J. Agr. Food Chem. 21(2): 186-192; 1973.* (9 references)

The uptake, distribution, and dissipation of ^{14}C-labeled dimethylamine salt of 2,4-D (DMA-2,4-D) were studied in three species of fish, water, and hydrosol. Fish were exposed to 0.5, 1.0, or 2.0 mg/l. concentrations of herbicide for up to 84 days. Radioactive residues of 2,4-D were determined by radiometric procedures in eight or more tissues and organs. Residues of 2,4-D were determined in muscle and whole-body extracts by gas chromatography. Radioactive residues were found in all fish tissues and organs analyzed, but actual 2,4-D content was negligible in muscle, indicating that most of the ^{14}C-residue was a metabolite(s) of 2,4-D. Residues of 2,4-D declined in water to less than 0.1 mg/l. after 35 days and in hydrosol to less than 0.1 mg/kg after 14 days. (Author abstract reprinted by permission of the American Chemical Society)

73-1436. Kapoor, I. P.; Metcalf, R. L.*; Hirwe, A. S.; Coats, J. R.; Khalsa, M. S. (Dept. of Entomol. Univ. of Illinois at Urbana-Champaign, Urbana, IL 61801). **Structure activity correlations of biodegradability of DDT analogs.** *J. Agr. Food Chem. 21(2): 310-315; 1973.* (15 references)

Methoxy-methiochlor [2-(*p*-methoxyphenyl)-2-(*p*-methylthiophenyl)- 1,1,1-trichloroethane], methyl-ethoxychlor [2-(*p*-methylphenyl)— 2-(*p*-ethoxyphenyl)-1,1,1-trichloroethane], and chloro-methylchlor [2-(*p*-chlorophenyl)-2-(*p*-methylphenyl)-1,1,1-trichloroethane] were studied for metabolic pathways in mice and insects and for biodegradability in a model ecosystem. Methoxy-methiochlor and methyl-ethoxychlor were good substrates for multifunction oxidases and showed biodegradability indices of 2.75 and 1.20, respectively. Chloro-methylchlor, with only a single degradophore on the aromatic ring, was also a satisfactory substrate and showed a biodegradability index of 3.43, compared to 0.015 for DDT. (Author abstract reprinted by permission of the American Chemical Society).

73-1437. Lubitz, J. A.; Freeman, L.; Okun, R. (Calbio Pharmaceuticals, La Jolla, CA). **Mitotane use in inoperable adrenal cortical carcinoma.** *J. Amer. Med. Ass. 233(10): 1109-1112; 1973.* (9 references)

Pure mitotane (*o,p'*-DDD, TDE) was administered by 95 investigators to 115 patients with adrenal cortical carcinoma which could not be cured by surgery. Response to mitotane was not related to sex, age, weight, or race. Of the patients with elevated pretreatment urinary steroid excretion levels, 85% had decreased urinary steroids $>$ 30% after treatment. Ninety-four percent of the patients who showed a definite disease response exhibited a steroid response. The mean survival time in patients with a disease response was 10.3 months compared with 2.4 months in nonresponders. Adverse reactions to the drug were gastrointestinal, neuromyal, and dermal. Seventeen percent showed no side effects at doses of 9 to 10 mg/day or greater. A definite clinical response was observed in 54% of the patients. Early, continuous treatment of inoperable adrenal cortical carcinoma with mitotane appears to be beneficial.

73-1438. Johannsen, F. R.; Knowles, C. O. (Dept. of Entomol., Univ. of Missouri, Columbia, MO 65201). **Citrate accumulation in twospotted spider mites, house flies, and mice following treatment with the acaricide 2-fluoro-*N*-methyl-*N*-(1-naphthyl) acetamide.** *J. Econ. Entomol. 65(6): 1754-1756; 1972.* (14 references)

The action of monofluoroacetic acid derivatives in mammals presumably involves transformation of fluoroacetic acid to fluorocitrate, which inhibits aconitase activity in the tricarboxylic acid cycle, resulting in citrate accumulation. Mice were injected three times intraperitoneally with various concentrations of Nissol

(MNFA) in corn oil. Houseflies were treated with Nissol by topical application or injection, and mites by dipping. Citric acid levels in whole mice 3-12 hr after Nissol treatment were 2-3 times those of controls; the intraperitoneal LD50 of Nissol in the mouse was 200 mg/kg. The topical LD50 of Nissol in the housefly was 525 mg/kg, and the injection LD50, 14 mg/kg. Citric acid levels in Nissol-treated flies at 3-12 hr post-treatment were 20-40% higher than those in controls. The contact LC50 of Nissol for twospotted spider mites was 250 ppm, and the citric acid values in treated mites were 30-60% higher than in controls. Citrate accumulation in mouse tissues decreased in the order heart > kidney > brain > liver, and amounts remaining in these tissues 12 hr after Nissol treatment were 1.4-3 times those in controls. Poisoning symptoms in mice and flies corresponded to classical organofluoride poisoning.

73-1439. Tomlin, A. D.; Forgash, A. J. (Dept. Entomol. and Econ. Zool., Rutgers Univ., New Brunswick, NJ 08903). **Metabolism of Gardona by gypsy moth larvae.** *J. Econ. Entomol. 66(1): 6-9; 1973.* (6 references)

The metabolic products of the insecticide Gardona, (2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate) (tetrachlorvinphos), in 3rd-stage *Porthetria dispar* (L.) larvae, were determined after exposing the larvae for 24 hours to a topical LD50 of the insecticide. The unabsorbed portion of the dose, the frass, and the larvae were assayed for Gardona and its metabolic products by solvent extraction and acid hydrolysis followed by gas liquid chromatography. The following metabolic products were found: 2,4,5-trichloroacetophenone ; 1-(2′,4′,5′-trichlorophenyl) ethan)-1-ol; 2,4,5-trichlorophenacyl chloride, and 1-(2′,4′,5′-trichlorophenyl)-2-chloroethan)-1-ol. These products could be extracted from the frass and larvae in quantity following acid hydrolysis of the brei, for only small amounts were found prior to acid hydrolysis. The assumption is that these products form conjugates in the larvae which are unextractable by solvents. Approximately 47% of the applied dose was recovered as Gardona and its products. A pathway for the metabolism of Gardona in gypsy moth larvae is proposed. (Author abstract by permission)

73-1440. Chamberlain, W. F.; Hopkins, D. E. (Entomol. Res. Div., Agr. Res. Serv. U.S. Dept. of Agr., Kerrville, TX 78028). **Metabolism of ^{14}C-labeled Stauffer R-3828 by a steer.** *J. Econ. Entomol. 66(1): 119-125; 1973.* (4 references)

Metabolic studies of ^{14}C-labeled Stauffer R-3828 (*S*-(*p*-chloro-*alpha*-phenylbenzyl) *O*,,*O*-diethyl phosphorodithioate), administered orally to a Hereford steer, indicated that detoxification proceeds by several pathways, the principal one being the breakdown to chlorobenzhydrol which conjugates largely with glucuronic acid. However, the discovery of the oxygen analogue of R-3828 and of desethyl derivatives demonstrated that other pathways exist for the breakdown of R-3828. The equilibrium that exists between the amounts of chlorobenzhydrol, chlorobenzophenone, and the glucuronides depends to a large extent on the acid-base relationships and the strength of the glucuronide bond. (Author abstract by permission)

73-1441. Miller, R. W.; Gordon, C. H. (Animal Sci. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Beltsville, MD 20705). **Effect of feeding Rabon to dairy cows over extended periods.** *J. Econ. Entomol. 66(1): 135-138; 1973.* (12 references)

Five dairy cows were fed Rabon insecticide (2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate) (tetrachlorvinphos) at levels ranging between 36-252 ppm of an air-dry ration during an entire gestation period. One of the cows was carried through an additional gestation period. Milk residues were generally nondetectable (<0.005) but were occasionally as high as 0.014 ppm. Rabon was detected in only 1 tissue sample and then at a level of only 0.02 ppm. House fly, *Musca domestica* L., larval mortality generally was related to the amount of Rabon appearing in the feces. Feeding of the insecticide did not appear to have an adverse effect on the general health or reproductive performance of the cows. (Author abstract by permission)

73-1442. Sherman, M.; Herrick, R. B. (Coll. of Tropical Agr., Univ. of Hawaii, Honolulu, HI 96822). **Fly control and chronic toxicity from feeding two chlorinated organophosphorus insecticides to laying hens.** *J. Econ. Entomol. 66(1): 139-145; 1973.* (11 references)

The effects of administering technical SD-8211 (2-chloro-1-(2,5-dichlorophenyl) vinyl dimethyl phosphate) and SD-8280 (2-chloro-1-(2,4-dichlorophenyl) vinyl dimethyl phosphate) at concentrations of 50, 200, and 800 ppm in the feed of laying hens for 1 year were studied. The mean daily intake of actual insecticide per hen was estimated as 5.2, 20.4, and 84.2 mg for those receiving 50, 200, and 800 ppm of SD-8211, respectively, and 5.3, 20.8, and 80.3 mg for those receiving 50, 200, and 800 ppm SD-8280, respectively. More effective fly control was obtained in droppings from SD-8280-treated hens than from SD-8211-treated hens. Levels as low as 50 ppm resulted in moderate control of the house fly, *Musca domestica* L., and a flesh fly, *Boettcherisca peregrina* (Robineau-Desvoidy), but at least 200 ppm were required for good control of these species and moderate control of an anthomyid, *Fannia pusio* (Wiedemann); a blow fly, *Chrysomya megacephala* (F.); and a flesh fly, *Parasarcophaga argyrostoma* (Robineau-Desvoidy). No hen mortality occurred that could be attributed to insecticidal treatment, but there was an inhibition effect on blood plasma cholinesterase activity related to insecticidal concentration. Egg production was slighly lower in hens fed 800 ppm SD-8280 than in the

control hens. However, overall feed consumption, body weight, feed efficiency, egg weight, interior egg quality, shell thickness, egg flavor, and egg odor were normal in all treated hens. (Author abstract by permission)

73-1443. Batth, S. S.; Singh, J.; Villeneuve, D. C. (Pestic. Bioassay Lab., Can. Dept. of Agr., Ottawa, Canada.) **Dichlorvos vaporizers: Method for evaluation under simulated household use.** *J. Econ. Entomol. 66(1): 146-150; 1973.* (7 references)

The room-size test chamber developed for evaluating dichlorvos vaporizers adequately simulated the practical home conditions, since levels of air-borne dichlorvos concentration were found about the same both in the chamber and a house bedroom, each containing a typical dichlorvos vaporizer hung from the ceilings. Almost 100% kill of the susceptible laboratory house flies, *Musca domestica* L., occurred in about 70 minutes when they were exposed in cages to an air-borne dichlorvos concentration of 0.1 μg per liter in the chamber, whereas when exposed as free-flying insects, comparable mortality occurred in 45 minutes. No adverse effect on plasma cholinesterase activity was observed in rats exposed in the chamber to a dichlorvos vapor concentration of 0.5 μg per liter for 3 weeks. (Author abstract by permission)

73-1444. Harris, C. R.; Svec, H. J.; Sans, W. W. (Res. Inst., Can. Dept. of Agr., London 72, Ontario, Canada). **Toxicological studies on cutworms. IX. Laboratory and microplot field studies on effectiveness and persistence of some experimental insecticides used for control of the darksided cutworm.** *J. Econ. Entomol. 66(1): 199-203; 1973.* (11 references)

Laboratory and field microplot studies were conducted to assess the effectiveness of 20 insecticides against *Euxoa messoria* (Harris) attacking flue-cured tobacco. Primary screening tests in the laboratory indicated that 6 of 19 insecticides were equally or more effective by direct contact than DDT, but all were less effective than chlorpyrifos. Secondary screening tests conducted in the laboratory on three of these insecticides, Bay 77049 (diethquinalphione), Biothion (Abate), and leptophos, indicated that all were effective as soil and/or stomach poisons. Microplot field trials showed that leptophos and Bay 77049 were more effective than chlorpyrifos as rye cover-crop treatment. Biothion was less effective than chlorpyrifos but more effective than Stauffer N-2596 (*S*-(*p*-chlorophenyl) *O*-ethyl ethylphosphondithioate). Residue studies indicated that N-2596 and chlorpyrifos dissipated quickly from the rye cover-crop. Leptophos and Biothion were more persistent. In soil Biothion was most persistent > leptophos > N-2596 > chlorpyrifos. No detectable residues of any of the insecticides were found on the fresh tobacco leaves at harvest. (Author abstract by permission)

73-1445. Harris, C. R.; Svec, H. J.; Sans, W. W. (Res. Inst., Can. Dept. of Agr., London 72, Ontario, Canada). **Toxicological studies on cutworms. X. Laboratory and field microplot studies on effectiveness and persistence of some experimental insecticides used to control the black cutworm in organic soil.** *J. Econ. Entomol. 66(1): 203-208; 1973.* (23 references)

Laboratory and field microplot tests were conducted to determine the effectiveness of some experimental insecticides in controlling *Agrotis ipsilon* (Hufnagel) attacking vegetables grown on organic soil. Primary screening tests in the laboratory with 12 insecticides indicated that 8 were more toxic by contact than DDT, and 4 as or more toxic than endrin to 3rd-stage cutworms. Secondary laboratory screening tests done with 6 of the insecticides applied as EC formulations to the surface of moist and air-dry organic soil indicated that chlorpyrifos, leptophos, Stauffer N-2596 (*S*(*p*-chlorophenyl) *O*-ethyl ethylphonodithioate), and Bay 77049 (diethquinalphione) were most promising. Microplot field trials, using plots seeded to onions and artificially infested with 4th-stage cutworms, indicated that leptophos was most effective > chlorpyrifos > N-2596 > DDT. Residues of all 3 experimental insecticides were moderately persistent in organic soil, but no residues were detected in onions harvested from the plots treated at the highest rate of insecticide application of 2.24 kg active ingredient per hectare. It was concluded that leptophos and chlorpyrifos warrant field testing on a larger scale for black cutworm control on organic soil. (Author abstract by permission)

73-1446. Grant, B. F.; Mehrle, P. M. (Bureau of Sport Fish. and Wildl., Dept. of Interior, Columbia, MO 65201). **Endrin toxicosis in rainbow trout (*Salmo gairdneri*).** *J. Fish. Res. Bd. Can. 30(1): 31-40; 1973.* (26 references)

In mature rainbow trout (*Salmo gairdneri*) receiving sublethal doses of endrin (4.3-145 μg/kg body wt/day in 0.215-7.25 mg/kg of food) for 163 days and then forced to swim for 1 hr, the insecticide affected serum electrolytes, osmolality, total protein, cholesterol, cortisol, lactate, glucose, liver glycogen, and growth. Forced swimming alone altered 9 of 16 serum parameters examined. Apparent increases in serum Na and Cl and significant increases in osmolality and liver glycogen were directly related to dosage. A biphasic distribution of phosphate, total protein, and cholesterol with dosage was apparent. Glucose was increased about 50% by 145 μg/kg but was unaffected by lower doses. Variance analysis of zone electrophoretic patterns disclosed an interaction between serum protein distribution and dose. Mobilization of liver glycogen was apparently inhibited by low doses and almost totally blocked by high doses. Correspondingly, trout given 14.5 μg/kg or more had lowered serum cortisol levels whereas the lowest dose elevated cortisol. Growth was inhibited appreciably by 145 μg/kg exposures. We conclude that endrin caused

dysfunction of physiologic processes critical to survival. (Author abstract by permission)

73-1447. Caley, R. M.; Jensen, R. G. (Dept. Nutr. Sci., Univ. Connecticut, Storrs, CT 06268). **Effects of parathion on lipolysis in isolated rat adipose tissue cells.** *Lipids 8(1): 43-44; 1973.* (15 references)

In a short communication parathion was reported to inhibit lipolysis in isolated rat fat cells about 50% at $10^{-6}M$. A linear relationship was obtained between parathion concentration and free fatty acids released. Parathion inhibited the action of epinephrine on lipase activity, but not that of cyclic AMP. This suggests that parathion acted on adenylcyclase, which increases cyclic AMP activating lipase, rather than on lipase itself. Parathion enhanced the antilipolytic response to nicotinic acid.

73-1448. Gleyberman, S. Ye.; Volkova, A. P. (All-Union Sci. Res. Inst. Disinfection Sterilization, Moscow, USSR). **Sravnitel'naya toksichnost' dietiltoluamida, sintezirovannogo na neftyanom i kamennougol'nom metaksilole. [Toxicological comparison of diethyltoluamides as synthesized from petroleum and coal metaxylene.]** *Med. Parazitol. 40: 39-45; 1971.* (14 references) (Russian)

Diethyl toluamide (deet) synthesized from petroleum metaxylene and from coal metaxylene was studied in laboratory experiments and in field trials for a toxicological comparison. Changes of the initial raw materials were not reflected in the toxic properties of the repellent, and both preparations were of medium toxicity to warm-blooded animals. No skin-resorptive, cumulative, and allergenic properties of either diethyltoluamide were determined with rabbits. Both preparations affected the skin and mucosa similarly. No objective or subjective changes were observed in the general state of health, skin, arterial pressure, inner organs, and blood of subjects regularly using 40%-lotion of petroleum-derived diethyltoluamide.

73-1449. Shardina, R. A. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Diseases, USSR). **Gigiyenicheskaya i sanitarno-toksikologicheskaya kharakteristika nitrafena v vode vodoyemov. [Hygienic and toxicological assessment of nitrofen in water reservoirs.]** *Med. Zh. Uzb. 5: 26-28; 1972.* (Russian)

Hygienic and sanitary assessment of nitrofen in water reservoirs and toxicological investigations in albino rats and rabbits are described. The odor threshold in water was determined as 0.58 mg/l. with 1.38 mg/l. for practical purposes. High odor stability was evidenced in water. Nitrofen in a concentration of 0.006-6 mg/l. did not interfere with the self-purification and sanitary processes of water bodies while a concentration of 0.39 mg/l. caused a slight yellowish coloration. Albino rats and rabbits fed 150-700 and 280-940 mg of nitrofen per kg body weight developed irritation, respiratory troubles, heart palpitations, tremor, highly increased muscular tone or atony, lassitude, paralysis, clonic-tonic spasms, hyperemia of the inner organs, distended abdomen, and focal hemorrhages in the lungs and of the brain sinusoid vessels. Deaths due to asphyxiation occurred on the first to fifth days. The LD50 values for rabbit and albino rat were 780 and 410 mg/kg body weight.

73-1450. Boyko, I. B. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Diseases, USSR). **K toksikologicheskoy kharakteristike insektitsida bazudina. [Toxicologic assessment of basudin.]** *Med. Zh. Uzb. 5: 33-35; 1972.* (Russian)

Toxicological investigations of basudin (diazinon) in albino rats, mice, and rabbits are reviewed. The acute LD50 values on ingestion were 120, 240, and 370 mg/kg. A single dose of 100 mg/kg inhibited the whole blood cholinesterase activity 73.7% in 24 hours; another dose of 25 mg/kg caused no clinical manifestations. Cholinesterase activity inhibition and poisoning symptoms produced by 50 and 100 mg/kg single doses disappeared in 14 and 5-6 days, respectively. An acute threshold dose of 15 mg/kg causing 35.2% and 44% inhibition in 1 and 24 hours with respect to cholinesterase activity inhibition was determined. Doses corresponding to 1/10, 1/20, and 1/50 of the respective LD50 values were used in chronic poisoning tests over six months. The 1/10 and 1/20 LD50 doses inhibited the cholinesterase activity in the liver, spleen, kidney and brain 80%, that in the erythrocytes and serum 60-74%. The hemoglobin, erythrocyte, and leukocyte pictures remained normal. Effects on the functional status of the liver were most pronounced. Basudin is concluded as having a high acute toxicity, particularly in mice; the acute threshold dose is 15 mg/kg. A slight cumulative effect with basudin was evidenced.

73-1451. Miryakubova, D. A.; Savicheva, S. M. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Disease, USSR). **Patomorfologicheskiye i gistokhimicheskiye izmeneniya v organakh eksperimental'nykh zhivotnykh pri zatravke geksakhloranom v usloviyakh teplovoy nagruzki. [Pathomorphological and histochemical changes in organs of test animals poisoned with hexachlorane under thermal stress conditions.]** *Med. Zh. Uzb. 5: 37-39; 1972.* (Russian)

Morphological and histochemical changes were studied in the organs of albino rats fed 0.05 mg of hexachlorane (BHC) per kg body weight. The rats were maintained in an atmosphere containing 0.21 (group 1), 0.05 (group 2), or 0.024 (group 3) mg of hexachlorane per m^3 and a temperature of 34-35 C for 8 hours daily. Acute hyperemia and congestion of cerebral vessels were accompanied by edema of cerebral membranes and

chromatolysis. Focal atelectasis and emphysematous alveoli in the lungs occurred along with destructive alterations in the liver, such as granular atrophy, necrosis, and reduced glycogen content. Acute hyperemia of cardiac vessels, edema and vacuolization of muscular fibers, and focal hemorrhages were apparent in the heart. Kidney changes included edema of the stroma, hyperemia, granular dystrophy of the epithelium of the canals, and moderate lymphoid-histiocyte infiltration of the stroma. Adrenal glands showed edema, swelling of cortical cell cytoplasm, and hyperemia of the venous sinuses. Hemorrhage in the spleen, moderate desquamative catarrh in the stomach and large intestine, swelling and desquamation of the epithelium of the small intestines, and granular dystrophy of the spermatogenic epithelium in the testes were observed in group 1. Slight proliferative changes in group 2 were determined. Uneven distribution and decrease of RNA and DNA in the karyoplasm were evidenced. Group 3 did not essentially differ from the control group.

73-1452. Abdusaidov, T. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Diseases, USSR). **Vliyaniye tiamina, askorbinovoy kisloty, galaskorbina, kokarboksilazy na funktional'noye sostoyaniye pecheni pri kombinirovannom otravlenii geksakhloranom i rogorom. [Effects of thiamine, ascorbic acid, galascorbin, and cocarboxylase on the functional status of the liver in combined hexachlorane and dimethoate poisoning.]** *Med. Zh. Uzb. 5: 39-41; 1972.* (Russian)

The effects of thiamine, ascorbic acid, galascorbin, and cocarboxylase on the functional status of the liver were studied in rabbits poisoned with a combination of hexachlorane (BHC) and dimethoate over 90 days. The poison mixture, 3.8 mg of dimethoate plus 3.2 mg of hexachlorane per kg of body weight, was introduced by gastric tube. The poisoned animals were given subcutaneous injections of 2 mg thiamine, 6 mg cocarboxylase, 30 mg ascorbic acid, or 50 mg galascorbin per kg of body weight. The liver function was tested by means of hexenal, bromsulphalein, and mercuric chloride. Of all substances investigated, galascorbin normalized the hepatic functions best. It also normalized such parameters as cholinesterase activity, cholesterol level, and alkaline phosphatase level. Thiamine significantly reduced the cholinesterase activity, but left the cholesterol content at the level observed in already recovered animals. Galascorbin is recommended for use in the therapy of patients with chronic pesticide poisoning.

73-1453. Haque, R.; Tinsley, I. J.; Schmedding, D. (Dept. Agr. Chem. and Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR 97331). **Lipid binding and mode of action of compounds of the dichlorodiphenyltrichloroethane type: a proton magnetic resonance study.** *Mol. Pharmacol. 9(1): 17-22; 1973.* (26 references)

Chemical shift changes, particularly in the resonance peak of the choline protons, were observed in the PMR spectrum of lecithin in carbon tetrachloride when DDT and its derivatives were added. A large change (low-field) in chemical shift of the benzylic proton of *p,p'*-DDT at low concentration was produced by increasing concentrations of lecithin, while *o,p'*-DDT and methoxychlor gave a much smaller response. No effect was observed at low concentrations of TDE and the lecithin spectrum masked the peak with DDA and larger concentrations of TDE. Compounds substituted ortho to the benzylic carbon showed a change in chemical shift. Lecithin produced no change in the PMR spectrum of DDE. The changes observed probably result from complex formation involving an acid proton of the DDT type compound and the phosphate of lecithin. A correlation exists between the chemical shift changes and the toxicity of DDT type compounds.

73-1454. Kelly-Garvert, F.; Legator, M. S. (Div. Toxicol., Food and Drug Admin., Dept. Health, Education, Welfare, Washington, DC 20204). **Cytogenetic and mutagenic effects of DDT and DDE in a Chinese hamster cell line.** *Mutat. Res. 17(2): 223-229; 1973.* (15 references)

A consistent increase in Arg^8 to Azg^r mutation frequency over control level was observed in Chinese hamster cells exposed to suspensions of DDE at concentrations ranging from 30 to 35 μg/ml. The same concentrations of DDE significantly increased chromosome aberrations, including exchange figures and chromatid breaks in cytogenetic studies. Polyploid cells and endomitotic figures were frequently seen in the DDE treated cells. Exchange figures are important indicators in cytogenetic analysis since cells with particular types of exchange figures are viable and genetic changes can be transmitted to the next generation. DDT had no significant effect on mutation frequency or the occurrence of chromosome aberrations.

73-1455. Fulde, S. (Warsaw, Poland). **Die wichtigsten Untersuchungsprobleme beim Einsatz von CCC. [Major problems for study in CCC use.]** *Nahrung 16(1): 47-48; 1972.* (German)

Domestic manufacture of CCC (chlormequat chloride) was begun in Poland due to a need to increase wheat yields. The domestic name is "Antywylegacz," while CCC sold for export is "Pol-CCC." Preliminary approval has been granted for use of CCC in Poland up to the end of 1972 based on toxicologic data already available. The peroral LD50 in the rat is 273 mg/kg; the daily no-effect dose in the rat (determined in the subchronic 90-day test) is 6 mg/kg body weight; residues when 2 or 4 kg CCC/ha is used in accordance with instructions are not more than 0.25 ppm in wheat grain and less than 7.8 ppm in wheat straw. Before final approval is granted, further studies will have to be per-

formed on CCC residues in grain after use under various conditions and effects of continuous CCC ingestion via food on human health. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279).

73-1456. Kolodziejczyk, A. (Psczyna, Poland). **Akute, subchronische, und chronische toxikologische Untersuchungen von CCC. [Acute, subchronic, and chronic toxicologic studies on CCC.]** *Nahrung 16(1): 49; 1972.* (German)

A variety of toxicologic tests was performed with the Polish-produced preparation Antywylegacz, based on CCC (chlormequat chloride). The oral toxicity of CCC increases in the order mouse < rat < guinea pig < rabbit, and is higher in females than in males except in the guinea pig. The acute dermal LD50 in rat and rabbit is more than 10,000 mg/kg. Application of a 75% CCC solution to mucous membranes of rats and rabbits resulted in only a temporary reddening of the connective tissue. Peroral administration of 2-162 mg/kg daily doses of CCC as a 75% aqueous solution, six times a week, produced no significant deviations in blood cholinesterase activity or blood cell count. A slight increase in blood cholinesterase activity in female animals contrasted with a significant drop in brain cholinesterase. Using a safety factor of 100, the maximum permissible daily dose was calculated as 0.06 mg/kg. This would yield a provisional tolerance value of 9 mg/kg/day for CCC in grain. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279).

73-1457. Sosnierz, M.; Szczurek, Z. (Katowice, Poland). **Bewertung der chronischen Toxizitaet des CCC auf Grund morphologischer und histochemischer Untersuchungen. [Evaluation of the chronic toxicity of CCC based on morphological and histochemical studies.]** *Nahrung 16(1): 50; 1972.* (German)

Groups of male and female Wistar rats were treated six times a week for 97 days with peroral doses of CCC (chlormequat chloride) at 2-162 mg/kg/day. Specimens of stomach, small intestine, liver, lung, heart, kidney, spleen, and testicles were collected, fixed in 10% formalin, and examined histopathologically with HE and Sudan III stains. Passive hyperemia and hemorrhages developed in the groups given 18, 54, or 162 mg/kg due to parenchymatous degeneration of myocardial fibers. Hemosiderin deposition and catarrhal enteritis were observed at the highest dose. Similar pathological changes were seen in rats given CCC at 40-1080 mg/kg in drinking water for four or eight months. Increased alkaline phosphatase levels in liver and kidney were seen at both test dates in the highest dosage group. Acetylcholinesterase content of brain and striated musculature were unchanged. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279).

73-1458. Juszkiewicz, T.; Stefaniak, B. (Pulawy, Poland). **Toxikologische Untersuchungen des CCC. [Toxicologic studies on CCC.]** *Nahrung 16(1): 50-51; 1972.* (German)

The acute toxicity of various preparations of CCC (chlormequat chloride) from different manufacturers, determined by the probit method ranged from 330 to 484 mg/kg in the rat. The differences in LD50s were attributed to differences in purity of the preparations. Symptoms of acute poisoning included clonic spasms, perspiration, salivation, conjunctival hyperemia, and lachrymation. Repeated administration of CCC at 30 mg/kg body weight per day resulted in significantly increased weight gain during the first two weeks with a slight gain in the succeeding weeks. Of a number of biochemical parameters examined, only the erythrocyte cholinesterase activity had increased. This was interpreted as biochemical adaptation of the rat to CCC administration in view of the similarity of CCC to acetylcholine. Slight poisoning symptoms were seen in animals given a single dose equal to half the LD50. Leukocytosis, reduced plasma potassium content, increased plasma sodium content, reduced ascorbic acid concentration, changes in cholesterol content and adrenal weight, and disturbances of electrolyte balance were recorded at autopsy. These findings point to effects on the hormone system, as well as an esterase-inhibiting effect of CCC. (Lecture presented at seminar on proolems of CCC use, see abstract 73-1279.

73-1459. Lewerenz, H. J. (Potsdam-Rehbruecke, DDR). **Beitrag zur toxikologischen Untersuchung und Beurteilung von CCC. [Toxicologic investigation and evaluation of CCC.]** *Nahrung 16(1): 51; 1972.* (German)

CCC (chlormequat chloride) has a marked acetylcholine-like parasympathetic stimulating effect and may influence microsomal oxidation. The LD50 in mammals ranges from 10 mg/kg to more than 1000 mg/kg body weight. Liver changes in rats and liver and kidney damage in sheep after a single dose of CCC have been reported. Five days after a single dose of CCC, the urine of a lactating cow contained 2 ppm CCC, and the quantity in the milk reached a maximum of less than 1 ppm in 16 to 20 hours after administration. CCC residues were detectable in various organs and tissues of rats after a single dose of CCC and after prolonged administration in the diet. Liver damage was determined in rats on low-protein diets even after relatively low doses of CCC. In a 90 day experiment on sheep, with daily CCC dose levels of 1, 2, 5, and 10 mg/kg body weight, blood bilirubin and nonprotein nitrogen were elevated in almost all animals, making the previously recommended permissible daily dose of 7.5 mg/kg questionable. A preliminary CCC tolerance of 0.5-1.0 ppm in foods is recommended. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279.

73-1460. Juszkiewicz, T.; Rakalska, Z.; Dzierzawski, A. (Pulawy, Poland). **Der toxische Einfluss von CCC auf die Feten des Goldhamsters. [Toxic effects of CCC on golden hamster fetuses.]** *Nahrung 16(1): 52; 1972.* (German)

The embryotoxic and teratogenic effects of CCC (chlormequat chloride) were tested by single peroral administrations of 400, 300, 200, 100, 50, and 25 mg/kg on the eighth day of gestation or by three doses of 100 mg/kg each on the seventh, eighth, and ninth days. Some mothers died in the highest dosage group and symptoms of poisoning were noted in the three highest dosage groups. The dams were killed on the 14th day of gestation, and the numbers of living, dead, resorbed, and malformed fetuses counted. Fetuses in the three highest dosage groups were significantly smaller than controls. Fetal resorption was increased at CCC doses up to 100 mg/kg. The most common malformations observed in the three highest dosage groups plus the 3 X 100 mg/kg group were skull malformations and sometimes anophthalmos and polydactyly. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279).

73-1461. Zebrowski, L.; Ruszkowski, M. (Pulawy, Poland). **Untersuchungen ueber die carcinogenen und cocarcinogenen Eigenschaften von CCC bei der virusbedingten Entstehung von Neoplasmen. [Studies on the carcinogenic and cocarcinogenic effects of CCC in virus-induced tumors.]** *Nahrung 16(1): 52-53; 1972.* (German)

Four generations each of two strains of mice were fed wheat from CCC (chlormequat chloride)-treated plants in a carcinogenicity test. One strain was inbred and showed no incidence of spontaneous tumor development; the other, colony-bred, harbored a tumor virus and was used to test for cocarcinogenicity (2-8% spontaneous mammary carcinoma development rate). After 14-20 months, no tumors were found in CCC-treated or untreated inbred mice. The mammary tumor development rate in CCC-treated colony-bred mice was 7.5%, and in the controls, 8.7%. Ingestion of CCC-treated wheat does not seem to affect carcinogenesis in these mice. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279).

73-1462. Rakalska, Z.; Dzierzawski, A. (Pulawy, Poland). **Der Einfluss von CCC auf das Elektrokardiogramm des Kaninchens. [The effect of CCC on the rabbit electrocardiogram.]** *Nahrung 16(1): 53; 1972.* (German)

The effect of CCC (chlormequat chloride) on the rabbit heart was investigated. After the recording of a control EKG, rabbits were given 50 or 100 mg CCC/kg per os. EKG tracings were then recorded after 0.5, 1, 2, 3, and 4 hours or until cardiac arrest occurred in dying animals. Six of the eight rabbits in the higher dosage group died within three hours after CCC administration. Symptoms, including listlessness, salivation, and respiratory difficulties disappeared within four hours after administration in survivors. Only slight deviations were recorded in the EKG of the 50 mg/kg group despite the presence of clinical poisoning symptoms. Changes in the EKG in the 100 mg/kg group were more marked: lowering of the ST segment, changes in peak amplitude (elevation of $R_{1,2}$ and $T_{1,2}$; in some animals the Q-wave diminished or disappeared simultaneously with elevation of the $S_{1,2}$ wave). Sinus arrhythmia developed shortly before death. The clinical and electrocardiographic findings are in accord with the parasympathicomimetic, acetylcholine-like effects of CCC, and the EKG changes are due to myocardial hypoxia. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279).

73-1463. Romanowski, H. (Lublin, Poland). **Die Resorption des Chlorcholinchlorides (CCC) in Ratten und die Ausscheidung mit dem Urin. [Uptake and urinary excretion of CCC in rats.]** *Nahrung 16(1): 53-54; 1972.* (German)

The quantity of unchanged CCC (chlormequat chloride) in the gastric contents of rats was determined at various times after a single oral administration of 0.4 g CCC. The absorption amounted to 76.05% after 2 hours, 77.25% after 4 hours, 80.1% after 6 hours, 83.6% after 8 hours, 90.3% after 10 hours, and 98.4% after 15 hours. Absorption proceeded somewhat more slowly when a smaller dose (.02 g/kg) was administered. However, absorption of the smaller dose was essentially complete in 5 hours, whereas absorption of the larger dose took 15 hours. After a single dose of 0.4 g/kg, 34% of the CCC was excreted as such, and as two metabolites with *Rf* values of 0.64 and 0.8; on the second day 3.4% of the CCC and one substance with *Rf* 0.64 was excreted in the urine; and on the third day 1.8%. The percentages were slightly higher after administration of 0.3 g/kg. When rats were given CCC at 0.05 g/kg per day for three weeks (ca. 1/20 LD50 per day), an average of 24.7% of CCC and one substance with *Rf* 0.64 were found in the urine. This indicates that each day 74.5% of the CCC was excreted in the urine or broken down to a substance with *Rf* 0.64. (Lecture presented at seminar on problems of CCC use, see abstract 73-1279).

73-1464. Kagan, Yu. S. (All-Union Res. Inst. for Hyg. and Toxicol. of Pestic., Polymers, and Plastics, Kiev, USSR). **Aktuelle Fragen der Toxikologie phosphororganischer Insektizide. [Current problems in toxicology of organophosphate insecticides.]** *Nahrung 16(2): 127; 1972.* (German)

The selectivity of action of organophosphates, which are only slightly toxic to warm-blooded animals but highly toxic to insects, may result from certain structures in the molecule which provide for rapid degradation by the mammals. Studies of selective toxicity to certain organs and organ systems in man have revealed

that phthalophos (phosmet), which contains a phthalimide group in its molecule, has embryotoxic characteristics. Methylmercaptophos and dichlorvos, even at relatively low concentrations, stimulate contractions of the rabbit uterus, thus offering experimental confirmation of the high incidence of spontaneous abortions observed among humans in areas of high organophosphate use. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1465. Lohs, K.; Gibel, W. (Forschungsstelle fuer chemische Toxicol. der DAW, Aussenstelle Berlin-Buch, Germany). **Tierexperimentelle Untersuchungen ueber die hepatotoxische und cancerogene Wirkung des Trichlorphon. [Experimental studies on hepatotoxic and carcinogenic effects of trichlorfon.]** *Nahrung 16(2): 127-128; 1972.* (German)

Previously, the alkylating properties of organophosphates, especially the methyl esters of phosphorous, thiophosphorous, and phosphonic acid derivatives were regarded from the chemical viewpoint, and not from the viewpoint of reactivity in vivo. Until recently, the discussion of in vivo reaction behavior was dominated by the phosphorylation processes linked with enzyme inhibition which governed the search for antidotes. Trichlorfon had marked toxic and carcinogenic effects in animal studies, contrary to previous opinions which held that it was a compound of low toxicity. These preliminary findings necessitate further study of the in vivo alkylating properties of trichlorfon, especially with a view toward improving occupational hygiene in the manufacture and use of trichlorfon. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1466. Halacka, K.; Polster, M. (Hyg. Inst. J. E. Purkyne Univ., Brno, Czechoslovakia). **Beitrag zur hygienisch-toxikologischen Problematik einiger antimikrobiell gebrauchter Organozinnverbindungen. [Hygienic and toxicologic problems regarding some antimicrobial organotin compounds.]** *Nahrung 16(2): 128-129; 1972.* (German)

The antimicrobial efficacy of organotin compounds was tested on about 50 species of bacteria, yeasts, and fungi. Tributyltin oxide, tributyltin acetate, tributyltin chloride, tributyltin laurate, tributyltin oleate, tributyltin benzoate, and triphenyltin acetate were highly effective against yeasts, molds, and bacteria. When administered perorally to rats, the tin compounds tested had toxicity values similar to those of the chlorinated hydrocarbons (LD50 = 100-250 mg/kg); skin and mucous membrane toxicity is also similar. However, the toxicity of tributyltin derivatives to zooplankton, phytoplankton, and other forms of aquatic life is relatively high (LD50 = 0.002-0.1 ppm). Therefore, a maximum permissible level of 3 g/liter in water has been established although complete absence of tributyltin derivatives from water bodies would be preferable. Residues of organotin compounds can be removed from water bodies by oxidation with agents such as potassium permanganate, chlorinated lime and other hypochlorites, or chlorine gas, as well as by precipitation of tributyltin in alkaline media in the presence of magnesium chloride followed by adsorption on the $Mg(OH)_2$ formed. (Lecture presented at symposium on nutrition and health, see abstract 73-1282).

73-1467. Nagasaki, H. (Nara Prefect. Med. Univ. Sch. of Hyg., Japan). **[Experimental studies on chronic toxicity of BHC.]** *Nara Igaku Zasshi (J. Nara Med. Ass.) 24(1/2): 1-26; 1973.* (38 references) (Japanese)

Technical BHC was mixed with the daily diet and administered to male dd-strain mice for 24 weeks at levels of 6.6, 66.0, and 660.0 ppm. All animals in the 660 ppm group showed many tumors in the liver. Each isomer (α, β, γ, and δ) was also administered separately in the same manner for 24 weeks at levels of 100, 250, and 500 ppm. All animals in the 500 ppm group and many (17/20) animals given 250 ppm of the α-isomer developed multiple tumors in the liver, but no metastases. In other groups no remarkable changes were found. After administration of technical BHC for 24 weeks, the liver contained 11.4 ppm α-BHC and 12.37 ppm β-BHC, respectively, in the 660.0 ppm group; 1.13 and 1.36 ppm, respectively, in the 66.0 ppm group; and 0.22 and 0.23 ppm, respectively, in the 6.6 ppm group. Residues of other isomers were negligible (all values on a wet weight basis). However, after administration of each isomer separately for 24 weeks, the residual levels in the above-mentioned organs increased in proportion to the amount of each isomer given.

73-1468. Cohen, S. D.; Callaghan, J. E.; Murphy, S. D. (Kresge Cent. Environ. Health, Boston, MA 02115). **Investigation of multiple mechanisms for potentiation of malaoxon's anticholinesterase action by triorthotolyl phosphate.** *Proc. Soc. Exp. Biol. Med. 141(3): 906-910; 1972.* (13 references)

Pretreatment of mice with 10, 17, 50, and 125 mg/kg of triorthotolyl phosphate (TOTP, tri-*o*-cresyl phosphate) resulted in 1.8-, 3.9-, 12.3-, and 31.4-fold increases in potentiation of malaoxon toxicity, respectively, as measured by brain ChE activity. TOTP at a dose of 50 mg/kg maximally inhibited hydrolysis of triacetin, diethyl succinate, and malathion by the liver and hydrolysis of triacetin by plasma. This finding suggested a mechanism in addition to carboxylesterase inhibition for potentiation of malaoxon toxicity by high doses of TOTP. No changes were observed in the sensitivity of mouse brain ChE to inhibition by malaoxon. Both malaoxon binding by the liver and inhibition of liver ChE increased as the dose of TOTP was increased from 50 to 125 mg/kg. The results suggest that both carboxylesterases and cholinesterases may bind mala-

oxon in the liver and that binding to liver ChE may become the primary mechanism of inactivation of malaoxon when carboxylesterases are maximally inhibited.

73-1469. Kiermayer, O. (Inst. fuer Entwicklungsphysiol., Univ. Koeln, Cologne, Germany). **Beeinflussung der postmitotischen Kernmigration von *Micrasterias denticulata* Breb. durch das Herbizid Trifluralin. [Influence of the herbicide Trifluralin on the postmitotic migration of the nucleus in *Micrasterias denticulata* Breb.]** *Protoplasma 75(4): 421-426; 1972.* (12 references) (German)

The influence of 10^{-2}-10^{-9}% solutions of Trifluralin was studied on the migration of the nucleus in *Micrasterias denticulata* Breb. cultured in Waris nutrient solution. Trifluralin in a concentration of 10^{-2}-10^{-5}% strongly affected the migration of the nucleus, leading to an abnormal position of the nucleus within the cell; migration of the chloroplast was inhibited. However, no effect on cell morphogenesis, such as growth and patterning of the primary cell wall, was evidenced. The findings suggest that Trifluralin, like colchicine, vinblastine, IPC(propham), and chloro-IPC (chlorpropham), disorganizes the microtubular system surrounding the post-telophase nucleus of *Micrasteria denticulata* Breb. The nucleus seems to lose its migration ability due to the destruction of this microtubular system.

73-1470. Guenther, E.; Nasta, A. (Sektion Biol., Ernst-Moritz-Arndt-Univ. Greifswald, Greifswald, DDR). **Vergleich der Wirkung eines Carbamatherbizids und von Colchicin auf die Mitose von *Allium cepa* und *Hordeum vulgare*. [Investigations on the effects of a carbamate herbicide and of colchicine on mitosis of *Allium cepa* and *Hordeum vulgare*.]** *Theor. Appl. Genet. 42(7): 310-313; 1972.* (10 references) (German)

Mitotoxic effects of the carbamate herbicide, Elbanil (chlorpropham), and of colchicine were compared on mitotically active root tip cells of *Hordeum vulgare* and *Allium cepa*. Elbanil was applied in concentrations of 0.1% for *Allium cepa* and in 0.005% for *Hordeum vulgare*; the latter was also treated with 0.1% colchicine solution. The duration of the exposure ranged from 0.5 to 3 hours. Both preparations caused abnormal mitoses in numbers increasing with time with C-mitoses being first to appear. Colchicine primarily inhibited spindles, especially in *Allium cepa*. The number of cells with more than 2n chromosomes increased and anaphases disappeared. The low frequency of C-mitoses in *Hordeum vulgare* was due to substantially shortened chromosomes. The sensitivity of the two species to colchicine was only about 50%. Spindle inhibition, C-mitosis, and polyploidy occurred after treatment with colchicine. The carbamate preparation also inhibited the spindle and strongly affected the chromosomes; however, the inhibition of mitosis was primarily caused by stickiness and pyknosis of the chromosomes with spindle inhibition being of secondary importance.

73-1471. Hashimoto, Y.; Makita, T.; Ohnuma, N.; Noguchi, T. (Bio-Med. Res. Div., Nisso Inst. for Life Sci., Nippon Soda Co., Ltd., Oiso, Kanagawa, Japan). **Acute toxicity [studies] on dimethyl 4,4′-*o*-phenylene bis(3-thioallophanate), thiophanate-methyl fungicide.** *Toxicol. Appl. Pharmacol. 23(4): 606-615; 1972.* (25 references)

A new thiophanate-methyl fungicide, dimethyl 4,4′-*o*-phenylene bis(3-thioallophanate), was studied in a variety of species of animals. The toxicologic examination of the compound showed the acute toxicity of thiophanate-methyl to be low, and the species or sex variation in sensitivity also to be low. Thiophanate-methyl did not exhibit significant activity in any of the toxicologic tests utilized, including inhalation, subchronic dermal, cutaneous sensitization, contact phototoxicity and photosensitivity and acute toxicity to fish. (Author abstract by permission)

73-1472. Hashimoto, Y.; Mori, T.; Ohnuma, N.; Noguchi, T. (Bio-Med. Res. Div., Nisso Inst. for Life Sci., Nippon Soda Co., Ltd., Oiso, Kanagawa, Japan). **Some pharmacologic properties of a new fungicide thiophanate-methyl.** *Toxicol. Appl. Pharmacol. 23(4): 616-622; 1972.* (8 references)

Thiophanate-methyl exhibited few general pharmacologic actions in various species of animals below the toxic dose, except for a weak sympathomimetic action, and a minute effect on the central and peripheral nervous system and various peripheral organs. Thiophanate-methyl also exhibited a slight hemolytic and anticoagulant activity. A decrease of about 20% in white cell count of rabbits treated with 1000 mg/kg of thiophanate-methyl was observed. No inhibition of cholinesterase was found. (Author abstract by permission)

73-1473. Ambrose, A. M.; Larson, P. M.; Borzelleca, J. F.; Hennigar, Jr., G. R. (Dept. of Pharmacol., Med. Coll. of Virginia, Health Sci. Div., Richmond, VA 23219). **Toxicologic studies on 3′,4′-dichloropropionanilide.** *Toxicol. Appl. Pharmacol. 23(4): 650-659; 1972.* (7 references)

Studies on 3′,4′-dichloropropionanilide (DCPA), a selective herbicide, are presented. For rats and dogs the single estimated po LD50 ± SD values are 1384 ± 99 mg/kg and 1217 ± 8 mg/kg, respectively. In subchronic (13 wk) studies in rats on 0, 100, 330, 1000, 3300, 10,000 and 50,000 ppm diets, survival of rats on the 50,000 ppm diet was affected, and at 10,000 and 3300 ppm, growth and feed consumption were depressed. Polychromatophilia was observed in rats on 3300 ppm diets. Significant decreases in hemoglobin values were found between controls and the 3 highest diet levels for 13 wk. In a chronic (2 yr) study in rats on 0, 100, 400,

and 1600 ppm diets, significant decrease in growth and increase in organ-to-body weights ratio for spleen, liver of females, and testes of rats on the 1600 ppm diet were noted. No dose-related effects were noted on hemograms, except for significant decreases in hemoglobin values for females on the 1600 ppm diet, urinary findings and histopathology. In a 2 yr study in dogs on 0, 100, 600 and 4000 ppm diets, no adverse trends were noted on survival, hematology, urinary findings, liver function tests, organ-to-body weight ratios (with the exception of the heart of dogs on the 4000 ppm diet) and histopathology. However, body weight of dogs on 4000 ppm diets was significantly depressed. In multigeneration studies in rats on 0, 100, 300 and 1000 ppm diets, no apparent deleterious effects or adverse trends were noted. Histopathologic studies on F/3b weanlings revealed no lesions. In summary, this study establishes 400 ppm as the overall apparent no-effect level. (Author abstract by permission)

73-1474. Watanabe, P. G.; Sharma, R. P. (Toxicol. Div. Dept. of Vet. Sci., Utah State Univ., Logan, UT 84321). **Inhibition of subcellular cholinesterases by 2-carbomethoxy-1-methylvinyl dimethyl phosphate (mevinphos) in vitro and in vivo.** *Toxicol. Appl. Pharmacol. 23: 692-700; 1972.* (12 references)

The rat brain subcellular cholinesterase behaved differently with respect to their inhibition as compared to acetylcholinesterase from bovine red blood cells or pseudocholinesterase from equine plasma. The bimolecular inhibition constants (*ki*) determined for all subcellular brain fractions were larger than those determined for either of the circulating enzymes. The variability in *ki* values was caused by the differences in affinity between the inhibitor and particular cholinesterase preparation. Rats treated with 4 mg/kg mevinphos showed variable inhibition of subcellular brain cholinesterases. There was no correlation between the degree of inhibition and clinical signs. The subcellular fractions prepared from heart tissue of treated animals showed consistent inhibition. (Author abstract by permission)

73-1475. Poore, R. E.; Neal, R. A. (Cent. in Environ. Toxicol., Dept. of Biochem., Vanderbilt Univ. School of Med., Nashville, TN 37232). **Evidence for extrahepatic metabolism of parathion.** *Toxicol. Appl. Pharmacol. 23(4): 759-768; 1972.* (21 references)

A method has been developed for semiquantitative measurement of the metabolism of parathion and other phosphorothioates to the phosphates in various tissues in vivo. The method is based on the fact that when parathion is incubated with isolated liver microsomes, a significant portion of the sulfur released upon parathion metabolism becomes covalently bound to the macromolecules of the microsomes. Therefore, measurement of radioactive sulfur bound to tissue macromolecules following administration of ^{35}S-parathion in vivo, or following incubation in vitro, should reflect the amount of parathion converted to paraoxon in the tissue. Following incubation of microsomes with labeled parathion, the amount of bound ^{35}S present exceeded the amount of bound ^{32}P, indicating that the sulfur is bound in a form free of phosphorus-containing parathion residue. Bound-sulfur results were in agreement with results from kinetic studies in terms of enhanced metabolism in phenobarbital-pretreated rats and inhibition of binding by addition of cupric ion to the incubation mixture. Following intraperitoneal injection of ^{35}S, ^{32}P parathion in rats, the amount of covalently bound ^{32}P in the lung was approximately half that in the liver. A considerably smaller amount of ^{35}S was bound to the macromolecules of the brain.

73-1476. Tulabayev, B. D. (Samarkand Agr. Inst., Samarkand, USSR). **Vliyaniye gerbitsidov na mikrofloru pochvy v posevakh khlopchatnika. [Effects of herbicides on soil microflora in cotton fields.]** *Uzb. Biol. Zh. 14(1): 11-14; 1970.* (3 references) (Russian)

Eptam (EPTC) and dalapon in 8 kg/ha doses and alanap (naptalam) in 5 kg/ha doses were applied as solutions to soil of cotton fields before or after sowing to determine the effects on soil microorganisms. Denitrifying bacteria activity increased and nitrifying and ammonifying bacteria activity, aerobic bacteria, cellulolytic fungi, actinomycetes, and azotobacter decreased during the first day after herbicide application. Eptam and alanap did not affect the development of nitrifying bacteria and azotobacter. Dalapon inhibited ammonifying and nitrifying bacteria, azotobacter, cellulolytic fungi, and actinomycetes. The findings indicate that the herbicides investigated should be applied about a month before sowing.

73-1477. Poloz, D. D.; Kokhtyuk, F. P. (All-Union Inst. Exp. Vet., Moscow, USSR). **Khronicheskoye otravleniye ovets fosfamidom. [Chronic poisoning of sheep with phosphamide.]** *Veterinariya (Moscow) 47(11): 83-86; 1971.* (Russian)

Effects of phosphamide (dimethoate) on sheep were studied in chronic poisoning experiments. Three different groups of animals were daily administered 0.5 mg/kg, 2 mg/kg, and 10 mg/kg doses of phosphamide via gastric tube for 10 to 240 days. Dose and exposure dependent functional troubles in the central and sympathetic nervous systems, loss of appetite, loss of tone of the skeletal muscles, asthenia, sialorrhea, miosis, diarrhea, reduced blood hemoglobin and erythrocyte counts, inhibition of the acetyl-cholinesterase activity, and reduced total sugar and total protein levels in the blood serum were determined. A subchronic dose of 10 mg/kg increased erythrocyte, leukocyte, and serum protein levels. While 0.5 mg/kg doses failed to produce clinical symptoms of poisoning in eight months, the acetylcholinesterase activity was decreased 17.2-27.3%

after three months. Inhibition of the acetylcholinesterase activity by 35%, reduction of the hemoglobin level by 9.4%, of the erythrocyte count by 12%, and increase in the leukocyte count by 18% were found after eight months of poisoning. The findings permit a maximum allowable phosphamide concentration in feed of 2 mg/kg or 0.2-0.3 mg/kg body weight up to three months. Feed for lactating ewes must be free from phosphamide.

73-1478. Dimitrov, S.; Shipochliyev, T. (IBPRNB, Sofia, Bulgaria). **Za lechebniya efect na parpanita pri otravyaniya s fosfororganichni suyedineniya. [The therapeutic efficacy of parpanit in organophosphate poisoning.]** *Vet. Sbirka 12: 35-38; 1972.* (Bulgarian)

The mechanism of action of parpanit (caramiphen hydrochloride) and atropine was compared in Dipterex (trichlorfon) poisoned cats (160 mg/kg) in vivo and in frog neuromuscular preparations in vitro. Parpanit administered to intact cats in 10, 100, and 500 μg/kg doses did not affect blood and intrapleural pressure and lowered blood pressure temporarily. When administered in 1.0 and 2.0 mg/kg doses, parpanit inhibited respiration for 1 to 2 min. Atropine administered in 1.0 and 2.0 mg/kg doses severely lowered blood pressure and increased the respiratory motion amplitude and intrapleural pressure. When applied to dipterex poisoned cats, both antidotes restored the above. Parpanit inhibited the nervous impulse conductivity upon electrical stimulation of the frog neuromuscular preparation. Parpanit as an antidote acts both as a spasmolytic of the smooth lung muscle and through the cholinoreactive system. Atropine acts only as a cholinolytic at the peripheral (smooth lung muscle) and central nervous system level (respiratory function) and is of low efficacy in diaphragm and intercostal muscle innervation impairment, as opposed to parpanit.

73-1479. Rozengart, V. I.; Chingisova, R. A.; Shmeleva, V. G.; Shcherbak, I. G. (Dept. Biochem., First I. P. Pavlov Leningrad Med. Inst., Leningrad, USSR). **Inaktivatsiya *O*-alkil-*S*-geksilmetiltiofosfonatov tkanyami zhivotnogo organizma. [Inactivation of *O*-alkyl-*S*-hexylmethyl thiophosphonates in animal tissues.]** *Vop. Med. Khim. 18(5): 533-538; 1972.* (12 references) (Russian)

The rates of detoxication of the cholinesterase inhibitors LG-63 (*O*-ethyl-*S*-hexylmethyl thiophosphonate) and GA-95 (*O*-hexyl-*S*-hexylmethyl thiophosphonate) in animal tissues were studied in vitro and in vivo. The rates of detoxication were evaluated from the dynamics of the decrease in the intact compound concentration. The residues were estimated by thin-layer chromatography. The rate of inactivation determined for LG-63 was proportional to the inhibitor concentration in the 1-5 μM range in all the tissues studied. Further increase in the inhibitor concentration resulted in an increase in its detoxication rate in liver homogenates and in blood, and in its decrease in kidney homogenate. The degree of inactivation within 6 hr of incubation did not exceed 30-40% in blood and 60-70% in the brain, liver, and kidney. The rate of inactivation of GA-95 was nearly the same as that of LG-63 and did not usually exceed 35-45% within 6 hr. In vivo tests with LG-63 revealed a decrease of ca. 50% in the LG-63 concentration in rat tissues within 0.5-2 hr after intraperitoneal injection of 5 mg per kg of body weight.

73-1480. Nitschke, U.; Link, K. (Medizinische Klinik, Medizinische Akademie, Erfurt, DDR). **Beitrag zur Klinik und Biochemie hormonproduzierender Nebennierenkarzinome. [Clinical and biochemical aspects of hormone-producing adrenal carcinomas.]** *Z. Gesamte Inn. Med. Ihre Grenzgeb. 27(20): 896-905; 1972.* (44 references) (German)

Four cases of hormone-producing adrenal carcinoma and their treatment in three females and one male are described. Postoperative chemotherapy with daily 5-6 g doses of *o,p'*-DDD (TDE) failed to give satisfactory results. The intervals between first diagnosis and death ranged from 3 weeks to 24 months. The *o,p'*-DDD therapy had to be discontinued shortly after it was started due to allergic exanthema in one case.

73-1481. Shcherbakov, A. P. (Dept. Pathol. Anatomy, I. P. Pavlov Ryazan' Med. Inst., Ryazan', USSR). **Znacheniye kholinergicheskikh reaktsiy v patologii neyronov golovnogo mozga pri intoksikatsii antikholinesteraznymi veshchestvami. [Significance of cholinergic reactions in the pathology of cerebral neurons in poisoning with cholinesterase inhibiting substances.]** *Zh. Nevropatol. Psikhiat. im. S. S. Korsakova 72(7): 1068-1071; 1972.* (10 references) (Russian)

Changes produced in cerebral neurons by single lethal intraperitoneal doses of tabun (4 mg/kg) and metaphos (methylparathion) (20 mg/kg) were studied in white rats. Advancing edema of cortical and later of subcortical neurons, chromatolysis, pathological granulosity of Nissl's bodies, intracellular edema, increased adenosine triphosphatase activity, and reduced acid phosphatase activity were determined. The findings suggest connections of pathomorphologically changed neurons with disturbances in the acetylcholine and electrolyte metabolisms. Electrolyte fuchsinophilic neuron dystrophy due to poisoning with anticholinergic substances may be assumed.

73-1482. Thielemann, H. (Author address not given). **Untersuchungen zur Frage der Toxizitaet und duennschichtchromatographischen Identifizierungsmoeglichkeit der isomeren Nitrophenole (*o*-, *m*-, *p*-), des 2,4-Dinitro- und 2,4,6-Trinitrophenols in Waessern. [Studies on the toxicity and the possibility of thin-layer chromato-**

graphic identification of the *o*-, *m*-, *p*-nitrophenol isomers, 2,4-dinitrophenol and 2,4,6-trinitrophenol in water.] *Z. Wasser Abwasser Forsch. 4(1): 16-18; 1971.* 6 references) (German)

Problems of the toxicity in algae and bacteria and of the thin-layer chromatographic identification of the *o*-, *m*-, *p*-nitrophenols, 2,4-dinitrophenol, and 2,4,6-trinitrophenol in water were studied. The toxic limits of *o*-nitrophenol, *m*-nitrophenol, *p*-nitrophenol, and 2,4,6-trinitrophenol for bacteria and algae were about 1,000 and 36 mg/l., 300 and 28 mg/l., 100 and 40 mg/l., and 1,000 and 240 mg/l., respectively. The corresponding values for 2,4-dinitrophenol for coli and algae are 100 mg/l. and about 40 mg/l. The *o*-, *m*-, *p*-nitrophenols, 2,4-dinitrophenol, and 2,4,6-trinitrophenol in water can be either directly, or following chromatographic concentration, separated and identified by thin-layer chromatography using silica gel G plates previously activated at 120 C for two hours, benzene as solvent, and diazotized sulfanilic acid as reagent. Highly improved separation and identification of these compounds is possible by means of Silufol UV 254 foils using benzene or benzene-acetone mixture of 9:1 ratio as solvent.

73-1483. Reichenback-Klinke, H. H.; Ollenschlaeger, B. (Zool.-Parasitol. Inst., Univ. Muenchen, Munich, Germany). **Medikament-Spaetschaeden bei Fischen. [Residual damages in fish due to therapeutics.]** *Z. Wasser Abwasser Forsch. 3: 84-89; 1972.* (6 references) (German)

Residual histopathological damages in *Cyprinus carpio* L., *Salmo gardneri* Rich., and *Gobio gobio* L. due to the application in pond cultures of thiabendazole, trichlorfon, and other microbicidal and antiparasitic agents were studied. Thiabendazole applied at a rate of 2 g/liter caused death of some of the fish affected. Pigmentation and bloody infiltration of the kidney, and bloody inflammatory infiltration in the liver of trout and carp were observed. Trichlorfon applied in dose of 1 mg/liter produced lipoid deposits in the liver and kidney and damaged nerve cells in the medulla oblongata and cerebrum. Methylene blue, malachite green, copper sulfate, Gabbrocol, and masoten are recommended for use in fish ponds.

See also **73-1268** **73-1287** **73-1291** **73-1298** **73-1301** **73-1309** **73-1333**

73-1484. Fiorese, F. F.; Pirl, J. N.; Manio, P. R.; Carella, A. (Dept. of Pub. Health, Bureau of Toxicol., Chicago, IL 60612). **Ethchlorvynol reagent for functional groups detection.** *Anal. Chem. 45(2): 388-390; 1973.* (5 references)

Ethchlorvynol (1-chloro-3-ethyl-l-penten-4-yn-3-ol), a hypnotic drug, forms a carbonyl derivative in the presence of strong acids. Based on this phenomenon, a procedure was developed for the detection of compounds containing various functional groups. Two drops of a solution of the material to be analyzed were placed on the top of each of two activated Florisil columns. Three drops of 2% ethchlorvynol in chloroform were then added, followed by three drops of concentrated orthophosphoric acid. After one minute, five drops of 85% ethanol/water or other polar solvent were added to one column (the other served as control). The colors which developed were recorded immediately, then again five minutes later. Carbamates gave a green color with chloroform and no color with ethanol. The limit of detection for meprobamate, the most reactive carbamate tested, was 3 μg. Malathion gave a red color in chloroform. Other functional groups tested were indole derivatives, hydrazine derivatives, nonphenothiazine sulfur derivatives, and primary aromatic amines.

73-1485. Mestres, R.; Tourte, J.; Campo, M. (Lab. de Chimie Appliquee a l'Expertise, Fac. de Pharmacie, Montpellier, France). **Residus de pesticides. XXIV. Methodes simplifiees de recherches des residus de pesticides par chromatographie gazeuse pour un controle rapide. [Pesticide residues. XXIV. Simplified methods for detecting pesticide residues by gas chromatography for a rapid check.]** *Ann. Fals. Expert. Chim. 65(705): 418-426; 1972.* (10 references) (French)

Simplified multiple analysis, suitable for the detection of pesticide residues after elution on Florisil, and another direct method for gas chromatographic analysis by means of specific detectors are described. Both methods apply to pesticide residues in plants and vegetables. The simplified multiple analysis requires extraction of the residues by acetonitrile and elution on Florisil by means of petroleum ether. An eluate volume of four microliters is injected for gas chromatographic analysis by means of electron capture detector. The lower limit of detection for organophosphorus pesticides varies from 0.04 to 0.8 nanog corresponding to 0.01-0.2 mg/kg of sample. Pesticide residues not accessible for the general multiple analysis are determined directly by gas chromatography by means of specific detectors. Ethyl acetate is used for extraction. Organophosphorus pesticides are determined by thermionic detector, the lower limit of detection being 0.1 nanog or 0.1 mg/kg of sample, or by flame photometry, with sensitivity being the same. Organochlorine pesticide residues are determined by means of microcoulometric or electrolytic conductivity detectors. The sensitivity lies at 10 nanog or 0.1 mg/kg of sample.

73-1486. Morgantini, M.; D'Acunzo, G.; Piombino, O., Spina, A. M. (Lab. Chimico Provinciale Caserta, Italy). **Determinazione spettrofotometrica infrarossa del principio attivo in insetticidi domestice del tipo aerosol a base di DDVP. Nota I: Miscela DDVP, metilene cloruro, freon. [Determination of the active substance in domestic insecticides of the DDVP-based aerosol type by means of infrared spectrophotometry. Communication I: A mixture of DDVP, methylene chloride, and freon.]** *Boll. Lab. Chim. Prov. 22(4): 735-739; 1971.* (6 references) (Italian)

Dichlorvos (DDVP) aerosol preparations containing methylene chloride and freon and packed in cans for household use can be analyzed by infrared spectrophotometry between 10 and 10.2 μ. The freon weight is subtracted as the can weight loss after collecting a certain amount of the preparation into an appropriate container. The can must be handled carefully to collect all the liquid phase on the bottom of the analytical container. The solvent is evaporated under vacuum at 30°C, then the sample is restored to its initial concentration by addition of chloroform to equal the weight lost. Dichlorvos concentration is determined by calculation of absorbance from the logarithmic ratio of the transmittance recorded at 10 and 10.2 μ. The formulation components do not interfere in the determination.

73-1487. Uk, S.; Himel, C. M.*; Dirks, T. (Dept. Entomol., Univ. Georgia, Athens, GA 30601). **Mass spectrometric identification of mirex residues in crude extracts and in the presence of polychlorinated biphenyls.** *Bull. Environ. Contam. Toxicol. 8(2): 97-104; 1972.* (10 references)

Analysis of a mixture of mirex and Aroclor by low voltage MS resulted in complete separation of the two products. The former had a characteristic base peak at M/2 cluster while the polychlorinated biphenyls had their base peaks at the molecular ion (M). The best probe temperature range for detection of mirex and Aroclor 1254 in pork fat after extraction in benzene and treatment with sulfuric acid was 90 to 100°C. Extraneous peaks observed at higher temperatures indicated that sulfuric acid treatment or florisil column chromatography were not sufficient to remove organic impurities. Sensitivity could be improved with appropriate clean-up measures. The method is useful for confirmation of EC-GLC results by another laboratory since samples in organic solvent can be stored in a glass capillary tube plugged with glass wool for several weeks before testing.

73-1488. Chau, A. S. Y.; Wilkinson, R. J. (Inland Waters Branch, Dept. Environ., Ottawa, Ontario, Canada). **Chromous chloride reduction. VII. Stereochemistry and structure of the major product employed in the confirmation of endrin residues.** *Bull. Environ. Contam. Toxicol. 8(2): 105-108; 1972.* (10 references)

The stereochemistry of one of the isomers of the

product of reaction of endrin with chromous chloride, used in the identification of endrin residues, was investigated so that this stereochemistry of the isomer and other unknown related compounds could be assigned based on NMR analysis. Pentachloroendrin was prepared and ground with 90% sulfuric acid. IR and NMR spectra of the products were identical to that of pentachloro ketone (II) obtained from chromous chloride or chromous acetate reaction on endrin; an admixture of the product with ketone II did not depress the melting point. Since the identity of pentachloro-endrin (IV) had been established, the conversion of IV to the ketone by acid-catalyzed isomerization confirmed the stereochemistry of the chloromethylene group in the ketone. High resolution NMR and decoupling experiments to be reported elsewhere will substantiate the results.

73-1489. Westlake, W. E.; Ittig, M.; Gunther, F. A. (Univ. California Citrus Res. Cent. and Agr. Exp. Station, Riverside, CA). **Determination of *m-sec*-butylphenyl *N*-methyl-*N*-thiophenylcarbamate (RE-11775) in water, soil and vegetation.** *Bull. Environ. Contam. Toxicol. 8(2): 109-112; 1972.*

A GC method of analysis was developed for the determination of levels of *m*-sec-butylphenyl *N*-methyl-*N*-thiophenylcarbamate in the range of 0.01 ppm in soil, water, and grass and 0.1 ppm in alfalfa. Material was extracted from water and soil samples using methylene chloride. Pond mud required acetonitrile extraction, filtration, hexane extraction, and chromatography on silica gel. Plant material was blended with acetonitrile/water, extracted into hexane and chromatographed on alumina. A GC equipped with a Melpar flame photometric detector operated in the sulfur-sensitive mode was used for determination, although a nitrogen detector was equally satisfactory. Recoveries ranged from 70 to 122% depending on the kind of sample and were reasonably consistent within a sample type. Lower levels could probably be determined using a clean-up procedure prior to application of this method.

73-1490. Chau, A. S. Y. (Dept. Environ., Water Qual. Div., 867 Lakeshore Rd. Box 5050, Burlington, Ontario, Canada). **Confirmation of pesticide residue identity. Part III. Derivative formation in solid matrix for the confirmation of endrin by gas chromatograph.** *Bull. Environ. Contam. Toxicol. 8(3): 169-176; 1972.* (12 references)

The acid-catalyzed isomerization of endrin was carried out on a solid matrix of alumina, sulfuric acid, and water in plugged disposable pipettes. After one and a half hours or overnight the ketone was eluted with 2 to 5 ml of benzene, concentrated, and analyzed on a GC equipped with a tritium electron capture detector. The procedure can confirm the presence of as little as 1 ng of endrin in a clean-up sample extract and has been satisfactory for use with water, fish, and mud extracts. The yield of ketone using solid matrix derivation is similar to that obtained with "wet" chemistry at the upper scale of the range and higher at the lower range. Of the pesticides only dieldrin interferes with this method of detecting endrin at high concentrations.

73-1491. Shaw, D. G. (Dept. Chem., Harvard Univ., Cambridge, MA 02138). **Discrimination between PCB and DDT residues by a gas chromatographic-mass spectrometric technique.** *Bull. Environ. Contam. Toxicol. 8(4): 208-211; 1972.* (18 references)

A GC-MS procedure was developed for the confirmation of gas chromatographic analyses of polychlorinated biphenyls, *p,p'*-DDT, and *p,p'*-DDE in environmental samples. In order to establish a minimal level of instrumentation necessary, the GC used was a simple Aerograph A90-P3 and the MS, although capable of high performance, was operated at low resolution. Direct interfacing of the two instruments was not used. The sensitivity, however, was 1 to 2 orders of magnitude greater than that normally achieved by directly interfaced GC-MS systems. A glass collector was devised which could be transferred in toto from the GC to the MS or stored at -10° until MS analysis was performed. Fractions with the treatment time of *p,p'*-DDE were repetitively scanned over a mass range approximately 315 to 330. DDE peaks were observed at M/e = 316, 318, and 320 of relative intensity 77:100:49. The scan was over the mass range 350 to 365 for *p,p'*-DDT, and peaks were observed at M/e = 352, 354, and 365 of relative intensity 62:100:65. Freshly packed columns were necessary to collect nanogram quantities of *p,p'*-DDT. It is possible that small quantities of DDT are degraded by alumina deposits resulting from oxidation of the column; glass columns would probably improve the method.

73-1492. Demayo, A.; Comba, M. (Water Quality Div., Inland Waters Branch, Dept. Environ., 45 Spencer St., Ottawa, Ontario, Canada.) **The GC and direct inlets mass spectra of heptachlor and 1-hydroxychlordene.** *Bull. Environ. Contam. Toxicol. 8(4): 212-216; 1972.* (4 references)

Direct inlet and GC inlet mass spectra of heptachlor and 1-hydroxychlordene obtained with a mass spectrometer had important differences. The retro-Diels-Alder reaction was the major process which occurred in the MS with both compounds. The loss of a chlorine atom, and, less important, the loss of HCl, also took place upon electron impact. Mass spectra of the two compounds obtained through the GC inlet were quite different from those obtained through the direct inlet system. The strong molecular ion present in the direct inlet spectrum was absent with heptachlor. The retro-Diels-Alder reaction played an almost negligible role in the GC inlet spectrum. The latter reaction was also unimportant in the GC inlet spectrum of 1-hydroxychlordene. In this spectrum the loss of 2 hydrogens was

observed and some of the major peaks of the GC inlet spectrum of 1-hydroxychlordene were also present in the direct inlet spectrum of 1-ketochlordene. Under batch inlet system conditions, intermediate between direct inlet and GC inlet, there was a suggestion that heptachlor was formed from 1-hydroxychlordene.

73-1493. Demayo, A. (Water Qual. Div., Inland Waters Branch, Dept. Environ., 45 Spencer St., Ottawa, Ontario, Canada). **Gas chromatographic determination of the rate constant for the hydrolysis of heptachlor.** *Bull. Environ. Contam. Toxicol. 8(4): 234-237; 1972.* (8 references)

A GC equipped with an Ni(63), pulsed, electron capture detector and a column containing 3% OV-1 on Chromosorb W was used for the determination of heptachlor in hydrolysis studies. Benzene was added to the aqueous heptachlor and the mixture stirred vigorously, then allowed to separate. Extracts were analyzed and the amount of unhydrolyzed heptachlor calculated using the area under the heptachlor peak as measured by the electronic integrator. The hydrolysis constant at 29.88°C was calculated to be 0.0300 hr^{-1}, and the half-life of heptachlor at the same temperature was 23.1 hr.

73-1494. Rivers, J. B. (Hawaii Community Studies on Pestic., Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, HI 96822). **Gas chromatographic determination of pentachlorophenol in human blood and urine.** *Bull. Environ. Contam. Toxicol. 8(5): 294-296; 1972.* (4 references)

An accurate, more efficient method for analysis of pentachlorophenol (PCP) in human blood and urine has been devised by combining features from previously published procedures. Samples were acidified and extracted with benzene on a "Roto-Rack." The material was methylated with diazomethane, diluted with isooctane, and analyzed by GC along with PCP methyl ether of a similar concentration. Recoveries ranged from 89 to 99% and the limit of detectability was 0.01 ppm. Typical blood levels were in the range of previously published results based on an old technique.

73-1495. Hannan, E. J.; Bills, D. D. (Dept. Food Sci. Technol., Oregon State Univ., Corvallis, OR 97331). **Separation of aldrin from Aroclor 1254.** *Bull. Environ. Contam. Toxicol. 8(6): 327-328; 1972.* (3 references)

Two methods were found for separating aldrin from polychlorinated biphenyls using a GC equipped with a tritium electron capture detector. The most direct method employed an OV-225 column on which aldrin precedes Arclor 1254. This was useful only when no other early eluting peaks were present. The method which was more suitable for environmental samples utilized an SE-30/QF-1 and an OV-17 column. The aldrin peak coincides with the Aroclor 1254 peak 2 on the SE-30/QF-1 column and to the Aroclor peak 1 on the OV-17 column. The peaks were trapped from either column and reinjected onto the other for separation. It was also possible to separate dieldrin from Aroclor 1254 using the SE-30/QF-1 column first.

73-1496. Miller, C. W.; Shafik, M. T.; Biros, F. J. (Central America Malaria Res. Sta., Malaria Program, Cent. for Dis. Contr., Atlanta, GA 30333). **A method for sampling and analysis of propoxur in air.** *Bull. Environ. Contam. Toxicol. 8(6): 339-344; 1972.* (14 references)

A simple, rapid, and sensitive procedure for the determination of propoxur has been established. Standards of propoxur and its hydrolysis product, *o*-isopropoxyphenol, were derivatized using chloroacetic anhydride, and the products were extracted into benzene and chromatographed on a GC equipped with a tritium foil electron capture detector. The compounds yielded derivatives with identical retention times. Detector responses were approximately equal and linear to 200 pg, suggesting equivalent conversion to the chloroacetate derivative. Sodium hydroxide was used to trap residues in a Greenburg-Smith impinger. Optimum recoveries (90%) were obtained with air sampling periods up to 60 min. Trapped residues were derivatized and analyzed by GC.

73-1497. Soderquist, C. J.; Crosby, D. G. (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **The gas chromatographic determination of paraquat in water.** *Bull. Environ. Contam. Toxicol. 8(6): 363-368; 1972.* (11 references)

A rapid GC method of analysis requiring a minimum of equipment was devised for determining paraquat and diquat in river water. Residues were hydrogenated within 1 hr at an acid pH using PtO_2 as catalyst. The product was extracted into methylene chloride, reextracted into acid, and extracted again into CS_2. Aliquots of the CS_2 extract were analyzed on a GC equipped with a flame ionization detector. Columns contained 10% Triton X-100 plus 1% KOH on 70/80 AW and DMCS treated Chromosorb G. The limit of detectability was < 0.1 ppm, but recoveries in the range of 0.1 to 1.0 ppm were consistently low. Concentration of the water sample could extend the limit of detectability. The method was not applicable to crop materials.

73-1498. Tonkopiy, V. D.; Savateyev, N. V.; Brestkin, A. N.; Panov, A. N. (S. M. Kirov Military Medical Academy, USSR). **Ob opredelenii aktivnosti kholinesteraz v tkanyakh zhivotnykh posle vozdeystviya obratimykh ingibitorev. [On the determination of cholinesterase activity in animal tissues following administration of reversible inhibitors.]** *Dokl. Akad. Nauk SSSR 207(3): 736-738; 1972.* (8 references) (Russian)

A method for the determination of the cholin-

esterase activity following administration of a reversible inhibitor is described. The method is based on the ability of reversible cholinesterase inhibitors to block reactions of cholinesterase with irreversible organophosphate cholinesterase inhibitors. The bimolecular reaction rate for the interaction of cholinesterase with organophosphate inhibitor decreases when reversible inhibitor is added. Armine was used as the irreversible inhibitor and galanthamine and tacrine as reversible cholinesterase inhibitors. Cholinesterase activity was determined by Hestrin's method in blood samples taken before administration of reversible inhibitor to intact animals. The armine concentration used reduced the cholinesterase activity to 5-15%. Sampling was repeated after introduction of the reversible inhibitor, and the cholinesterase activity was determined both in the absence of armine and after incubation at 37°C for 30 min. The values obtained were used to calculate the cholinesterase inhibition by the reversible inhibitor.

73-1499. Nakamura, K.; Kaneda, Y.; Oka, H. (Nat. Inst. of Hyg. Sci., Min. of Health and Welfare, Tokyo, Japan). **[Studies on the extraction and the clean-up process of some pesticide residues in foods.]** *Eisei Shikenjo Hokoku (Annu. Rep. Nat. Inst. Hyg. Sci.) 90: 147-151; 1972.* (8 references) (Japanese)

The established method of extracting and cleaning-up pesticide residues in and on foods was questioned by the announcement of June 26, 1970 by the Ministry of Health and Welfare. The extraction solvents, column packings, column temperatures, and elution solvents were examined as to the percentage recovery of added pesticide combinations. The four combinations were: 20 μg each of γ BHC (lindane), aldrin, dieldrin, *p,p'*-DDT and 80 μg endrin; 20 μg of aldrin and dieldrin and 80 μg of endrin; one gram each of aldrin and dieldrin and 2 μg of endrin; 100 μg each of fenitrothion and parathion. All combinations were dissolved in 5 ml of *n*-hexane. The examined solvents were: benzene plus acetone (1:1); benzene; *n*-hexane. A Shimazu GC-3AE gaschromatograph with electron capture detector was used. The best results were obtained with benzene plus acetone (1:1) as the extracting solvent and a Florisil column treated in an oven at 140° rather than a Darco-G/Avicel column. In most cases, interferences from foods such as sweet potato, green pepper, lettuce, tomato, and butter were absent after clean up on a 10 g Florisil column and elution with 200 ml of 15% ethyl ether in *n*-hexane.

73-1500. Kirkland, J. J. (Biochem. Dept., Exp. Sta., E. I. duPont de Nemours & Co., Wilmington, DE 19898). **Method for high-speed liquid chromatographic analysis of benomyl and/or metabolite residues in cow milk, urine, feces, and tissues.** *J. Agr. Food Chem. 21(2): 171-177; 1973.* (17 references)

Residues of benomyl [methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate] and/or methyl 2-benzimidazolecarbamate, methyl 5-hydroxy-2-benzimidazolecarbamate, and methyl 4-hydroxy-2-benzimidazolecarbamate] may be simultaneously determined in cow milk, tissues, urine, and feces. The first step in the method consists of hydrolyzing the sample in aqueous acid to convert benomyl to methyl 2-benzimidazolecarbamate and to free the metabolites from conjugates. The freed materials are then extracted into an organic solvent, the extract is cleaned up by a solvent-solvent partitioning process, and the components are determined in a single scan by high-speed strong cation exchange liquid chromatography. Recoveries of the various components average 80% in milk and urine and 50-80% in tissue and feces. Recoveries of the various compounds have been demonstrated at the 0.01-0.02-ppm level in cow milk, at the 0.05-0.1-ppm level in tissues and feces, and at the 0.2-ppm level in urine. No interference with the method was found from a number of other pesticides with tolerances in milk and meat tissues. (Author abstract reprinted by permission of the American Chemical Society)

73-1501. Mendoza, C. E.; Shields, J. B. (Pestic. Sect., Food Div., Health Protect. Branch, Ottawa K1AOL2, Canada). **Determination of some carbamates by enzyme inhibition techniques using thin-layer chromatography and colorimetry.** *J. Agr. Food Chem. 21(2): 178-184; 1973.* (22 references)

The detection limits were determined by a thin-layer chromatographic-enzyme inhibition technique for aldicarb, Butacarb, C-8353, carbaryl, formetanate (HCl), Meobal, Mesurol, methomyl, and promecarb. Indophenyl and 5-bromoindoxyl acetates were used as substrates of porcine liver esterases. Effects of ultraviolet irradiation and bromine on the pesticides were also studied. Furthermore, inhibition of esterase activities by these carbamates was determined by spectrophotometry using indophenyl acetate (IPA) substrate. Percent inhibitions were based on IPA hydrolysis rate in the treated solutions at two different periods vs. that in the control enzyme solutions, and the absorbance of the treated solution at 7.5 or 15 min after the addition of substrate vs. the absorbance of the control solution. Both calculations gave comparable results. Results showed that the use of IPA in both chromatographic and spectrophotometric methods is satisfactory in confirming pesticides by an enzyme inhibition technique. (Author abstract reprinted by permission of the American Chemical Society)

73-1502. Muthu, M.; Majumder, S. K.*; Parpia, H. A. B. (Central Food Tech. Res. Inst., Mysore, 570013, India). **Detector for phosphine at permissible levels in air.** *J. Agr. Food Chem. 21(2): 184-186; 1973.* (14 references)

A paper-strip detector has been developed for detecting maximum acceptable concentrations (0.05-0.3 ppm) of phosphine in air. The strips are prepared by

dipping them in a 1% solution of mercuric chloride in methyl yellow. The papers turn red from the yellow. Ammonia interferes with the proper development of color. The strips are useful for personal protection against phosphine in fumigation and phosphine in fumigated commodities. (Author abstract reprinted by permission of the American Chemical Society)

73-1503. Suffet, I. H. (Dept. of Chem., Environ. Studies Inst., Drexel Univ., Philadelphia, PA 19104). **The *p*-value approach to quantitative liquid-liquid extraction of pesticides and herbicides from water. 2. Selection of water:solvent ratios and number of extractions.** *J. Agr. Food Chem. 21(2): 288-294; 1973.* (26 references)

The general goal of aqueous pesticide residue analysis is the recovery of 100% of a pesticide and its degradation products for qualitative and quantitative analysis. The *p*-value concept has previously been used to determine the pH and solvent to approach 100% pesticide recovery. In this paper, equations are developed from liquid-liquid extraction theory for the number of extractions and water : solvent ratios for maximum recovery for typical *p*-values. A computer program analysis of the equations developed indicates that a pesticide which has a *p*-value of $\geqslant$0.90 in an aqueous solvent system can be extracted from the aqueous phase with 95% recovery in $\leqslant$5 successive extractions of $\geqslant$50 ml with a total volume $\leqslant$500 ml of solvent. The equations were successfully tested with serial extraction of 2,4-D by separatory funnel and vortex stirring extraction procedures. The contribution of the total error of initial LLE step was estimated to be less than 20% for a four-step serial extraction. (Author abstract reprinted by permission of the American Chemical Society)

73-1504. Shafik, T. M.; Sullivan, H. C.; Enos, H. R. (Perrine Primate Lab., Environ. Protect. Agency, Perrine, FL 33157). **Multiresidue procedure for halo- and nitrophenols. Measurement of exposure to biodegradable pesticides yielding these compounds as metabolites.** *J. Agr. Food Chem. 21(2): 295-298; 1973.* (7 references)

The urinary level of phenolic compounds may be the key for establishing an index of exposure to pesticides containing this moiety as an easily hydrolyzed or metabolized portion of the molecule. A method has been developed for quantitating ten halo- and nitrophenols in rat urine which could result from exposure to and subsequent metabolism and excretion of a broad spectrum of pesticides. The procedure involves acid hydrolysis, extraction, derivatization, silica gel chromatography, and electron-capture gas chromatography. Male rats fed pesticidal compounds containing halo- and nitrophenol moieties at levels varying from factors of 10^{-5} to 10^{-2} of the LD50 were used to establish the usefulness of this procedure for determining the extent of exposure to the biodegradable pesticides. (Author abstract reprinted by permission of the American Chemical Society)

73-1505. Dubosq, F.; Dedde, M. (Lab. Rech. Anal., Soc. Usines Chem. Rhone-Poulenc, Paris, France). **Dosage du vamidothion technique ou formule par chromatographie en phase gazeuse. [Gas chromatographic determination of technical and formulated vamidothion.]** *J. Chromatogr. 71: 557-561; 1972.* (15 references) (French)

Vamidothion can be determined in technical or formulated products, including combinations with other organophosphates, by gas chromatography using a thermal conductivity detector. An acetone solution containing ca. 0.8% vamidothion is injected onto a glass column, 0.5 m long, 2 mm i.d., packed with silicone QF 1 on a silanized support. The column temperature of 185° (isothermal) and the injection and detector temperatures of 235° prevent decomposition of vamidothion. When the butylglycol ester of 2,4,5-T (0.35% w/v solution of material purified by repeated recrystallization) is used as the internal standard, vamidothion can be determined with precision of about 2%. The retention time of vamidothion under the conditions used is three minutes, and the retention time of the internal standard is 1.5 min. Slight modification of the temperature conditions and use of benzyl succinate as standard permitted separation of a mixture of seven organophosphates, including vamidothion, with the exception of a single peak for methyl parathion and malathion.

73-1506. Bruce, W. N. (Illinois Nat. History Survey and Illinois Agr. Exp. Sta. Urbana, IL 61801). **Separation and identification of carbofuran, its metabolites, and conjugates found in fish exposed to ring ^{14}C-labeled carbofuran using ITLC silica gel strips.** *J. Econ. Entomol. 65(6): 1738-1740; 1972.* (2 references)

To determine carbofuran and its metabolites in fish, the fish tissue is blended with acetone, dried with sodium sulfate, and filtered. The filtrate is mixed with acetonitrile and partitioned with hexane. Most of the acetonitrile is evaporated and the residue dissolved in acetone. The acetone solution is applied to the bottom of an instant thin-layer chromatography strip, and acetonitrile is allowed to ascend on the sheet for 1-3/4 inches. The upper edge of the acetonitrile front is marked, and after drying, the portion of the strip below the front is cut off and dropped into a flask of 0.25 *N*HCl. The remainder of the strip is placed on dental wick in a beaker of 15% acetone in hexane in a tank saturated with hexane vapors. The mobile phase is allowed to ascend to one inch from the top of the strip, allowed to dry for five min, and the bottom of the strip (½ in. above previously marked solvent front) cut off and dropped into HCl with the first residue band; the remaining strip is then hung in a hood, sprayed with 5% KOH in methanol, dried for 5 min, then sprayed with 0.1% *p*-nitrobenzenediazonium fluoborate in methanol.

The thin line bands across the strips are then cut out, cut into half-inch segments, and dropped into scintillation vials with a little methyl alcohol for counting. The conjugated derivatives, present in the sections immersed in HCl, are heated for 1 hr, then subjected to ITLC as above. Recovery is 95-100% complete.

73-1507. Cutkomp, L. K.; Desaiah, D.; Koch, R. B. (Dept. of Entomol., Fish. and Wildl., Univ. of Minnesota, St. Paul, MN 55101). **The in vitro sensitivity of fish brain ATPases to organochlorine acaricides.** *Life Sci. (Part II) 11: 1123-1133; 1972.* (26 references)

Several chlorinated hydrocarbon pesticides, considered to be specific acaricides, were shown to be in vitro inhibitors of the ATPase enzyme system from blue gill fish brain homogenates. Mitochondrial (oligomycin-sensitive) Mg^{2+} ATPase from fish brain was inhibited by each chlorinated bridge biphenyl compound (ovex, chlorbenside, chlorobenzilate, 4,4′-dichloro-*a*-methylbenzhydrol, and 2,4-dichlorophenyl benzenesulfonate). Moreover, these compounds were relatively ineffective on Na^+-K^+ATPase and the oligomycin-insensitive Mg^{2+} ATPase. In contrast, decachlorobi-2, 4-cyclopentadien-1-yl, a bicyclic pentadienyl compound, inhibited Na^+-K^+ ATPase and oligomycin-insensitive Mg^{2+}ATPase. An alkyl aryl sulfite, 2-(*p*-tert-butyl-phenoxy)-1-methylethyl 2-chloroethyl sulfite, was relatively ineffective on the ATPase enzyme system. An in vivo correlation, based upon behavior of mites, was shown between the effect on the ATPase system and acaricidal activity. (Author abstract by permission)

73-1508. Kortaski, A.; Drygas, M. (Warsaw, Poland). **Die Analytik von CCC und CCC-Rueckstaenden. [Analysis of CCC and CCC residues.]** *Nahrung 16(1): 54-55; 1972.* (German)

The most significant chemical and physical properties of CCC (chlormequat chloride) from the analytical viewpoint and the reactions suitable for analytical purposes are discussed. CCC is degraded by alkalies, even at moderate concentrations, to form neurin, trimethylamine, and acetylene. It is stable to acids and oxidizing agents. CCC forms slightly soluble complexes in water with heavy metals. These can be used for CCC detection in thin-layer and paper chromatography, but are not specific. Formation of ion pairs with organic cations such as phenolphthalein, nitrocresol, and napthalenesulfonic acid has not been described in the literature although other quaternary ammonium compounds undergo similar reactions. However, CCC can be determined photometrically by way of its complex with dipicrylamine. CCC forms a volatile compound, 2-thiophenyl-ethyldimethylamine, with thiophenol in alkaline media, which can be used for gas chromatographic determination. Total CCC content in formulations can be determined chromatographically or by titration. Oxygen bomb combustion can be used for micro-scale total chlorine determinations. For residue studies on plants CCC is extracted with polar solvents such as water, methanol, and ethanol. Interfering materials are removed by column chromatography, and CCC is best separated from other quaternary ammonium compounds by paper, thin-layer, or column chromatography. (Lecture presented at seminar on CCC use, see abstract 73-1279).

73-1509. Kretzschmann, F. (Postsdam-Rehbruecke, DDR). **Zur Analytik von CCC in Ernteprodukten und tierischen Materialien. [Analysis of CCC in harvested crops and animal materials.]** *Nahrung 16(1): 55; 1972.* (2 references) (German)

Determination of CCC (chlormequat chloride) in plant and animal products requires great care in the steps of extraction, cleanup, and determination. In the preferred test 100 g of vegetable material is boiled under reflux for three hr with 500 ml of 80% ethanol. After centrifugation 400 ml of the supernatant are evaporated to dryness, the residue taken up in water, and lipids removed by chloroform extraction. Mucoids are precipitated by addition of HCl. The concentrated extract is passed over a cation exchange column and eluted with 1 *N* HCl. The 300-600 ml fraction is concentrated, taken up in acetate buffer, and repurified by converting the ammonium bases into the periodides and uptake in dichloroethane. CCC is then determined by thin-layer chromatography. Animal material is similarly processed; water can be used for extraction. Fluids of animal origin (milk, urine) are deproteinated, then cleaned up by conversion of the quaternary ammonium compounds to the periodides. The recovery rate for plant material was 80-100%, and for milk, 50-60%. As little as 0.02 ppm CCC can be detected and as little as 0.1 ppm can be determined. Results showed up to 0.3 ppm CCC in wheat grains, 0.5 ppm in wheat straw, and 1-3 ppm in milk obtained from cattle eating feed containing 100 ppm CCC. (Lecture presented at seminar on CCC use, see abstract 73-1279).

73-1510. Romanowski, H. (Lublin, Poland). **Analytische Untersuchungen an CCC und sein Verhalten in verschiedenen Medien und einiger Bodenarten. [Studies on analysis of CCC in various media and its behavior in soil.]** *Nahrung 16(1): 56; 1972.* (German)

CCC (chlormequat chloride) was determined by means of its chloride ion (Chiba reagent) after paper-chromatogaphic separation from other quaternary ammonium compounds. Better detection was attained with Dragendorff's reagent. The red spots of known *Rf* can be scraped from the TLC plates, dissolved in acetone, and the color intensity read on a spectrophotometer. Paper electrophoresis is also suitable for separation of CCC. For extraction of CCC from animal material the specimen is homogenized with sodium sul-

fate solution and extracted with acetone. CCC can be extracted from plants with acetone-water. CCC is poorly extracted from soil by either water or acetone. Pure CCC was stable in distilled water, whereas technical CCC was partially converted into a substance with a TLC *Rf* of 0.64 (*Rf* of CCC, 0.48). Conversion into this product or into choline occurred upon exposure to alkalies or oxidizing agents. CCC was rapidly broken down to this derivative in a garden soil. Similar breakdown occurred in loess, diluvial soil, and humus, but at various rates. (Lecture presented at seminar on CCC use, see abstract 73-1279).

73-1511. Drygas, M. (Warsaw, Poland). **Bestimmung von CCC Rueckstaenden in Weizenkoernern und Weizenstroh mit der Duennschichtchromatographie. [TLC determination of CCC residues in wheat grain and straw.]** *Nahrung 16(1): 57; 1972.* (1 reference) (German)

A previously developed method for CCC determination was tested with ^{14}C-labeled CCC (chlormequat chloride) and partially modified. The average CCC recovery from wheat or straw extraction with ethanol was 66%. In the column chromatographic cleanup of the extract 99% of the applied quantity of CCC appeared in the first 100 ml of eluate. For better separation of CCC from other quaternary ammonium compounds it was necessary to replace one-dimensional thin-layer chromatographic separation by two-dimensional development in glacial acetic acid:acetone:15% HCl. The spots were visualized with Dragendorff's reagent, and CCC determined semiquantitatively by visual comparison of spots. The sensitivity was 0.3 ppm for grain and 0.7 ppm for straw, and the recovery rate was 66%. Residues of 0.25-2 ppm were found in wheat grains from 1967-1970, and residues in straw averaged 1.4-7.8 ppm. (Lecture presented at seminar on CCC use, see abstract 73-1279).

73-1512. Vajda, L.; Kovacs, J.; Vajda, L. (Author address not given). **Klortartalmu novenyvedoszerek hatoanyagtartalmanak vizsgalata. [Determining the active agent in organochlorine pesticides.]** *Nehezvegyip. Kut. Intez. Kozlem. 4: 83-91; 1972.* (14 references) (Hungarian)

Chemical analytical procedures for the determination of the active agent in organochlorine pesticides are described and evaluated. The Grote-Krekeler method has been retained for preparation. The pyrolytic gases are absorbed in a solution of sodium sulfite in sodium hydroxide. The solution to which silver nitrate is added is titrated with ammonium rhodanide solution. Schoniger's method, although requiring experience, is much faster than Grote's technique; the inherent negative error for high chlorine contents can be eliminated by the addition of carbohydrates such as mannitol or sugar. Schoniger's preparatory method was also combined with determination by means of a chloride-selective membrane electrode. This method proved to be suitable for rapid, accurate, continuous measurement.

73-1513. Biro, L. (Res. Inst. Heavy Chem. Ind., Veszprem, Hungary). **Ftalimid-tipusu novenyvedoszermaradvany meghatarozasa borban. [Determination of phthalimide type fungicide residues in wine.]** *Nehezvegyip. Kut. Intez. Kozlem. 4: 123-130; 1972.* (8 references) (Hungarian)

Colorimetric and infrared spectrophotometric methods for the determination of Difolatan (captafol) and Difolpet (*N*-1,1,2,2-tetrachloroethyl thiophthalimide) residues in wine are described. The wine sample to be investigated is first mixed with petroleum ether and then dried by means of sodium sulfate. The solvent is evaporated and the dry residue dissolved in a 1:1 mixture of acetone with water. Photometric determination is performed 40-50 min after adding the reagent, composed of pyridine, methanol, and sodium hydroxide. The sample is prepared in the same manner for infrared spectrophotometric investigation except that the residue obtained after the solvent is evaporated is dried by means of concentrated sulfuric acid under vacuum for 24 hr; the dry residue is then dissolved in chloroform. The solution obtained is dripped on potassium bromide which is then pressed into a tablet. Determination is done at wave lengths of 1,138/cm and 1,722/cm for Difolatan and at 1,028/cm and 1,748/cm for Difolpet. The extinction is a linear function of the concentration. Wine samples investigated by the above methods contained less than 1 ppm of Difolatan and Difolpet.

73-1514. Vajda, M.; Gorog, L.; Grega, J.; Parkany, M. (Res. Group Peptide Chem., Hungarian Acad. of Sci., Budapest, Hungary). **Adatok a 2-klor-4-etilamino-6-izopropilamino-sz-triazin hatoanyagtartalmu gyomirtoszerek gaskromatografias meghatarozasahoz. [Contribution to the gas chromatographic determination of herbicides on the basis of 2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine.]** *Nehezvegyip. Kut. Intez. Kozlem. 4: 195-200; 1972.* (13 references) (Hungarian)

A gas-chromatographic method for the analysis of herbicides containing 2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine as active agent (2-chloro-4,6-bis-ethylamino-*s*-triazine, 2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine and 2-chloro-4,6-bis-isopropylamino-*s*-triazine) is described. A Celite 545 type column with cyanosilicone XE-60 as the separating agent, nitrogen with hydrogen and air as a carrier gas, a column temperature of 195-200 C, and an injection temperature of 210-220 C are used. A flame-ionization detector with 240-260 C temperature is used for the determination. The method is suitable for the determination of any of the above compounds in their mixtures. The sensitivity of the determination is 3 to 10 ppb.

73-1515. Bruni, G.; Coassini Lokar, L.; Pertoldi Marletta, G. (Istituto Merceologia, Univ. Trieste, Italy). **Applicazioni dei metodi cromatografici nell analisi dei costituenti dei prodotti alimentari. [Applications of chromatographic methods in the analysis of food constituents.]** *Rass. Chim. 24(4): 187-204; 1972.* (795 references) (Italian)

Uses of chromatography in food analysis are reviewed. A bibliography on gas-liquid chromatography of organochlorine and organophosphate residues in vegetable, fruit, meat, milk, fish, and various food products is included. Thin-layer chromatography methods used for determining all pesticides are also mentioned. Combined thin-layer and column chromatography methods for the determination of organochlorines are listed. Sources referred to include methodologies published between the late 1950's and the end of 1971.

73-1516. Lipparini, L. (Ist. Merceologia, Univ. Bologna, Italy). **Il dosaggio di residui di DDVP in prodotti alimentari con un metodo enzimatico.[Determination of DDVP residues in food products by an enzymatic method.]** *Rass. Chim. 24(4): 222-225; 1972.* (8 references) (Italian)

The enzymatic determination of DDVP (dichlorvos) in food products is based on the formation of characteristic inhibition halos which occur on an agar-agar layer in the presence of cholinesterase and acetylcholine due to pesticide residues. Agar-agar layers on special plates are prepared with cholinesterase preparations extracted from human blood, preferably. Food sample chloroform extracts (tuna or bread sticks) are measured and placed in holes on the agar-agar layer and left to react with the enzyme for 18 hr. Similar amounts of calibrated DDVP solutions (100 μl) are placed in parallel holes. The plate is sprayed with an aqueous acetylcholine solution upon completion of the enzyme reaction period. Characteristic halos develop within 15 min and reach maximum visibility 50 minutes after acetylcholine application. The DDVP content in the food samples is evaluated by comparison of the halo diameters with those of the known DDVP concentration-generated circles. The method is sensitive enough to detect 0.1 ppm DDVP.

73-1517. Baluja, G.; Franco, J. M.; Murado, M. A. (Inst. de Quimica Organica, Madrid, Spain) **Falta de especificidad del metodo del tioindigo para la valoracion de acidos monohalogeno-aceticos en substratos complejos. [Lack of specificity of the thioindigo method for determination of monohalogenated acetic acid derivatives in complex substrates.]** *Rev. Agroquim. Tecnol. Aliment. 12(3): 456-462; 1972.* (17 references) (Spanish)

Thioindigo resulting from the reaction of thiosalicylic acid with monohalogenated acid develops a pink to red color whose intensity at λ = 550 nm is directly proportional to the amount of monohalogenated acetic acid. A similar color reaction occurred in the presence of different herbicides such as ethyl and isopropyl esters of 2,4-D and 2,4,5-T, isobutyl ester of 2,4-D, and 2,4,5-T-isooctyl ester preparations. When subjected to GLC, sharp peaks corresponding to the above esters and no indication of monohalogenated acetic acid derivatives in the analyzed preparations were observed. Apparently, the thioindigo reaction is not specific for monohalogenated acetic acid derivatives, and is produced by all phenoxyacetic acid derivatives capable of releasing an acetate group under conditions required for the formation of thioindigo.

73-1518. Baluja, G.; Castro, S.; Franco, J. M.; Murado, M. A. (Inst. de Quimica Organica General, Madrid, Spain). **Resultados del analisis de malathion tecnico por los metodos colorimetrico, IR y cromatografia gas-liquido. [Results of technical grade malathion analysis performed by colorimetric, IR, and gas-liquid chromatography methods.]** *Rev. Agroquim. Tecnol. Aliment. 12(4): 577-582; 1972.* (11 references) (Spanish)

A malathion based technical product was analyzed by colorimetry, IR, and GLC to test the validity of the colorimetric procedure. Analytical data were compared to those obtained with a 99.7% purity malathion cyanamide. Colorimetry performed according to the Norris procedure, modified by Orloski (readings at 420 nm), with a calibration curve linear for concentrations ranging between 1.0 and 30.0 mg revealed errors due to the instability of the cupric-*O,O*-dimethyldithiophosphoric acid complex in aqueous solution. IR spectrometry between 880 and 820 cm^{-1}, performed according to Uphan, provided data close to those obtained by GLC. The latter was performed with two columns, one with a single non-polar stationary phase (DC-200 on a Gas Chrom Q support) and the other with a mixed polar phase consisting of 15% QF-1 and 10% DC-200 on Chromosorb W. Operating conditions included an electron capture detector with tritium as a radiation source, pure nitrogen as a carrier gas, and 190 and 220°C at the column and injector, respectively. GLC allowed the determination of the extent of *O,O*-dimethyl-*S*-(1,2-dicarboethoxyethyl) dithiophosphate thione-thiol isomerization, essential for assessing the quality of the technical product. The thione-thiol conversion process could be followed through specific IR spectra of pure malathion, and observed upon heating between 80 and 150°C. The oral toxicity of pure malathion increases rapidly with the thione-thiol isomerization.

73-1519. Larini, L.; Prado, A. B.; Silva, H. C.; Carvalho, D. de (Disciplina de Toxicol. Fac. de Farm. Odontol. de Araraquara, Brazil). **Separacao e identificacao do BHC e DDT em meio a material biologico. [Separation and identification of BHC and DDT in biological materials.]** *Rev. Fac. Farm. Odontol. Araraquara 5(2): 195-206; 1971.* (30 references) (Portuguese)

A method is presented for separation and identification of BHC and DDT isomers in biological material by means of two-dimensional thin-layer chromatography. The procedure was applied to rat liver and stomach homogenates obtained from rats administered 800 or 1000 mg/kg technical BHC or 200-300 mg/kg technical DDT preparations. Insecticides were extracted twice with acetone and these extracts washed with water and reextracted with petroleum ether. The petroleum ether extract was purified on an activated aluminum oxide column and eluted with an ethanol/acetone/water (50/30/20 v/v) mixture. The eluate was then concentrated (warm air stream) and the residue dissolved in 10 ml ethanol. The ethanol solution was filtered through anhydrous sodium sulfate and evaporated to dryness on a steam bath. The residue was then dissolved in acetone, filtered, and reduced to a small volume for thin-layer chromatography. Two-dimensional TLC was performed on silicagel G layers activated at 105°C, using a 40-60°C petroleum ether/carbon tetrachloride (1:1) system in one direction and a cyclohexane/ethylacetate (9:1) system in the other direction. The traveling time for each solvent system amounted to 50 min. Spots were identified by spraying with a 0.1% benzidine in ethanol solution exposed to UV light. The procedure permitted identification of α-, β-, γ-, δ-, and a-BHC as well as p,p'-DDT and o,p'-DDT.

73-1520. Vickers, R. S.; Chan, P. W.; Johnsen, R. E. (Dept. Electrical Eng., Colorado State Univ., Fort Collins, CO 80521). **Laser excited Raman and fluorescence spectra of some important pesticides.** *Spectr. Lett. 6(2): 131-137; 1973.* (2 references)

Raman and fluorescence spectra of representatives of three groups of pesticides were studied following argon laser excitation. Although the Raman spectrum of ethion was quite strong, azinphosmethyl and parathion had strong fluorescence spectra over a wide range. It would be difficult to utilize the Raman or fluorescence spectra to identify azinphosmethyl and parathion. The Raman spectrum was very large compared with the fluorescence background of Furadan (carbofuran), making it useful for identification. The Raman spectrum of Baygon (propoxur) was similar to that of Furadan, but a very strong fluorescence background was present. Clear Raman spectra were exhibited by lindane and Aroclor, while thiodan (endosulfan) and dieldrin had dominant fluorescence spectra. Intense fluorescence was more characteristic of o,p'-DDT than any Raman lines. Laser induced Raman or fluorescence spectra might be useful for monitoring pesticide levels in air and soil.

73-1521. Skanavi, M. D. (Gor'kiy Sci. Res. Inst. Occup. Hyg. Occup. Diseases, Gor'kiy, USSR). **Fotometricheskoye opredeleniye malykh kolichestv metilmerkaptofosa v prisutstvii dimetilkhlortiofosfata. [Photometric determination of small quantities of methyl mercaptophos in the presence of dimethylchlorothiophosphate.]** *Zavod. Lab. 38(6): 666; 1972.* (4 references) (Russian)

A photometric method is described for the determination of methyl mercaptophos in the 10 to 100 μg range in the presence of dimethylchlorothiophosphate. Methylmercaptophos reacts with dimethylparaphenylenediamine in an acid (nitric acid) medium in the presence of mercury acetate and iron chloride to form a colored compound. Dimethylchlorothiophosphate does not react with dimethylparaphenylenediamine. The optic density and methylmercaptophos concentration of the solution in the 10-100 μg concentration range were linearly correlated. The lower limit of detection is 10 μg/10 ml solution and the maximum error 16%. Determination is possible by photometer or through visual comparison with a standard series.

73-1522. Thielemann, H. (Lehrstuhl f. Allgemeine und Kommunalhygiene, Martin-Luther-Universitaet Halle-Wittenberg, Halle, DDR). **Ueber den Nachweis der Reaktionsprodukte von Insektiziden und Chlordioxid. [On the detection of reaction products of insecticides and chlorine dioxide.]** *Z. Chem. 12(9): 343; 1972.* (German)

Possibilities for the thin-layer chromatographic visualization of the reaction products of chlorine dioxide with DDT, DDE, aldrin, endrin, dieldrin, BHC, DMDT (methoxychlor), and DNOC in aqueous medium were studied. Silica gel-G plates or Silufol UV 254 foils were used. A combination of silver nitrate and ammonia solutions with acetone was used as the chromogenic reagent. Only DMDT and aldrin could be detected after their reactions with chlorine dioxide. The *hRf* values were determined following ultraviolet irradiation (85 and 93 for aldrin on foil and silica gel-G, as well as 71, 64, 19 and 87, 74, 24 for reaction products of aldrin on foil and silica gel-G, respectively). The *hRf* values obtained for DMDT on foil and silica gel-G were 6 and 7, and the corresponding values for its reaction products on foil and silica gel-G were 63, 75, 84, and 58, 70 and 14, respectively. With foil UV 254, benzene as solvent, and diazotized sulfanilic acid as chromogenic reagent, DNOC could be determined over 2 μg, and qualitatively detected above 0.05 μg.

See also 73-1303 73-1305 73-1326 73-1337 73-1345 73-1347 73-1377 73-1453 73-1483

HAPAB QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, EPA Office of Pesticide Programs. It consists of two subject indexes (compound and concept) and two author indexes (personal and corporate).

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under these broader headings (e.g., organochlorines, herbicides, etc.).

Subheadings in the compound index are identical with the main headings in the concept index, the latter having a maximum of three levels of specificity in addition to the compound.

Following is a cross-referenced guide to the subject headings:

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